Case-mix adjusted mortality following Demick

This method uses the Bayesian logistic hierarchical model with hospital as the grouping factor and adjusting for age, payer, comorbidities, ventilator and year. The hospital level intercept term had a N(0,10) prior distribution (for deviations from the average) on the logit scale and all other slope parameters had a N(0,2.5) prior distribution. In table 2, we considered both patients nested within both hospital and year. Models were fit in R (v. 3.3.3) using the rstanarm package (v. 2.15.3). 4 runs of 1000 MCMC samples were taken after a 1000 sample burn-in. Convergence of the MCMC runs were verified using traceplots and other statistics. Our results are not sensitive to the choice of prior.

I believe the degree of shrinkage we’re seeing here is reflective of the small numbers of patients we see at each hospital (median = 7, mean = 9.5).

Overall:

|  |  |
| --- | --- |
| Percentile | Mortality Rate |
| 0% | 5.68 |
| 10% | 5.81 |
| 25% | 5.83 |
| 50% | 5.85 |
| 75% | 5.87 |
| 90% | 5.90 |
| 100% | 5.96 |

Table

By year:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Percentile | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| 0% | 9.46 | 7.91 | 9.44 | 6.66 | 6.81 | 5.93 | 5.51 | 5.24 | 4.60 | 4.30 |
| 10% | 9.69 | 8.10 | 9.66 | 6.83 | 6.98 | 6.08 | 5.65 | 5.38 | 4.72 | 4.41 |
| 25% | 9.74 | 8.14 | 9.71 | 6.86 | 7.01 | 6.11 | 5.68 | 5.40 | 4.75 | 4.43 |
| 50% | 9.76 | 8.17 | 9.74 | 6.88 | 7.03 | 6.13 | 5.69 | 5.42 | 4.76 | 4.44 |
| 75% | 9.81 | 8.20 | 9.78 | 6.92 | 7.07 | 6.16 | 5.72 | 5.44 | 4.78 | 4.47 |
| 90% | 9.87 | 8.26 | 9.84 | 6.96 | 7.11 | 6.20 | 5.76 | 5.48 | 4.81 | 4.50 |
| 100% | 10.00 | 8.37 | 9.97 | 7.06 | 7.21 | 6.28 | 5.84 | 5.56 | 4.88 | 4.56 |

Table 2

Overall mortality using Bayesian hierarchical modeling

We fit a Bayesian hierarchical model with patients nested in hospital, using only a hospital-level intercept term with a N(0,10) prior distribution.

|  |  |  |
| --- | --- | --- |
|  | Percentile | Mortality Rate |
| 1 | 0% | 9.12 |
| 2 | 10% | 10.61 |
| 3 | 25% | 10.78 |
| 4 | 50% | 11.05 |
| 5 | 75% | 11.26 |
| 6 | 90% | 11.74 |
| 7 | 100% | 13.26 |

Table