## Module 3: Applications of Multi-level Models to Profiling of Health Care

 Providers1. Why do we need a multi-level model for profiling medical care providers? (check all correct answers)
(a) Data are clustered at multiple levels
(b) We need to take into account the correlation within medical providers
(c) We need to take into account the reliability of the different medical providers
(d) We need to take into account provider-specific characteristics and patients-specific characteristics
(e) All of above
2. What is "case-mix bias"? (check all correct answers)
(a) Bias arising from differences in patients characteristics across medical providers
(b) Bias arising from not taking into account correlation within medical providers
(c) Bias arising from not taking into account different sample sizes within providers
(d) Bias arising from not including into the model important patientspecific covariates
(e) Bias arising from not including into the model important providerspecific covariates
3. What is systematic variability? (check all correct answers)
(a) Variability across clusters of the true cluster-specific parameters
(b) Random noise in the residuals
(c) Natural variability as defined in Module II
(d) Statistical variance of the regression parameter estimates
(e) Variability of the patient-level characteristics across clusters
4. In the institutional ranking example, which of these factors affect the posterior variance of the ranks? (check all correct answers)
(a) Numbers of surgeries
(b) Numbers of deaths
(c) Success rate of surgery
(d) Posterior standard errors of the success rate
(e) Deviations between the success rate estimates and the population average
5. What type of statistical information would you suggest adding on Table 4 of Normand et al 1997 JASA? (check all correct answers)
(a) Estimates of the regression coefficients at the first and second stage of the hierarchical model
(b) $95 \%$ posterior intervals of the performance measures
(c) $95 \%$ posterior intervals of the ranks
(d) Number of MCMC iterations
(e) The table contains all necessary information
