Some Model Fit Statistics Printed by Multilevel Procedures

Models that are nested, in which one model contains a subset of the parameters from another model (and the same number of cases are used) can be compared with the likelihood ratio test (see the significance testing handout for more detail). When models are not nested, some researchers like to compare models using fit indices such as the AIC or BIC. These fit indices, which are based on deviance (-2 log likelihood which is indicated as *-2l* below), do not have any easily applied cutoffs for "good" fit or "bad" fit by themselves, as most applications will result in a fit index value well above the zero value that represents perfect fit. Although sometimes reported in articles to compare fit of non-nested models in order to choose the best fitting model, there seems to be no consensus on which index is best nor is there consensus even on their usefulness among users.

The following is an excerpt taken from Leyland's review of SPSS, which can be downloaded at
http://www.bristol.ac.uk/cmm/learning/mmsoftware/spss.html.[1]

2.3 Information criteria available through the MIXED command

In addition to –2 log likelihood (or –2 restricted log likelihood if the METHOD is set to REML), the MIXED command gives four information criteria to assist model selection and comparison. These are the Akaike information criterion or AIC (Akaike, 1973):

$$AIC = -2l + 2d$$

the finite sample corrected AIC, or AICC (Hurvich and Tsai, 1989):

$$AIC_C = -2l + \frac{2dn}{(n-d-1)}$$

the consistent AIC (CAIC; Bozdogan, 1987):

$$CAIC = -2l + d\left[\log(n)+1\right]$$

and the Bayesian information criterion or BIC (Schwarz, 1978):

$$BIC = -2l + d\log(n)$$

When using maximum likelihood estimation, n is taken to be the total number of level 1 units and d the number of fixed parameters plus the number of random parameters. For REML estimation, n is taken to be the total number of level 1 units minus the number of fixed parameters and d the number of random parameters.

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[1] I have sometimes seen differing formulas for some indices, so check documentation for any other software packages. The lme4 documentation does not provide formulas used for any of these indices.