

StatNews #51

Multi-Level Models in SPSS^{1 2}

May 2002

Revised 2012

Perhaps the most important new contribution of applied statistics to researchers in the last ten years has been providing the ability to analyze multi-level models. A major impediment for taking advantage of these models for many people has been that, of the general statistical packages, only SAS and more recently Stata could perform these analyses. Now, ten years after SAS introduced its multi-level procedure (proc mixed), a new version of SPSS has been released that allows users of that package to easily implement multi-level models.

The need for multi-level (also known as mixed or hierarchical) models is very common in many fields. These models are used for data collected at multiple levels or over time. Examples include experimental designs with randomized blocks and longitudinal regression models. Multi-level models have been an important advance because they can easily handle clustered data, continuous covariates, and missing observations. See [StatNews #2](#) for further explanation of multi-level models.

In SPSS version 11, multi-level models can be implemented from the SPSS menus. To test the procedures, we compared the results obtained from three models using SAS, SPSS and Stata. For the experimental randomized block design and the longitudinal regression model assuming random intercepts, the results were identical. When fitting a model with both random intercepts and random slopes, possible in SAS and SPSS but not in Stata, we found that SPSS does not allow the random intercepts and random slopes to be correlated. For example, this requires that the value of the dependent variable at the start of a longitudinal study be uncorrelated to the rate of change over time. Since these would usually be correlated, this limitation means that SPSS should not be used to fit models with both random intercepts and random slopes. SPSS staff has informed us that this limitation will be rectified in version 12.

To implement a multi-level model, data must be organized in the correct structure. Another noteworthy enhancement in the new SPSS version is a menu that allows transformation of repeated or longitudinal data from "wide" to "long" format or vice versa. See [StatNews #38](#) for more information about these data structures. This is so useful that even SAS and Stata users might be interested in using SPSS for this feature.

¹ The current version of SPSS is version 19. (2012, May)

² For more information, check the current SPSS menus.

Fitting multi-level models is more complex than fitting multiple regression models, and it is easy to fit a model that is meaningless or does not do what was intended. The staff of CSCU can provide assistance with specifying the appropriate model.

Authors: Wanphen Russameesopaphorn, Francoise Vermeyleen, and Edward Frongillo.

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