# Series Editor's Introduction
# to the Second Edition

The first edition of this book has been a bestseller. The book turned out to have just the right level of technical detail for many social and behavioral scientists. It also contained just enough practical suggestions and worked-out examples, and, in combination with the corresponding software HLM, it functioned for many people as a handbook and a user's guide for multilevel analysis. After 10 years, however, it is time for an update.

Multilevel analysis has developed a great deal over this 10 year period. In the social and behavioral sciences the technique caught on like wildfire, and many applications have been published. In some areas, HLM has become the norm for good data analysis, and the basic software packages have been generalized and otherwise perfected. Perhaps even more importantly, mixed models (of which multilevel models are an important special case) have become very dominant in statistics. This is true, in particular, for nonlinear mixed models and generalized linear mixed models (GLMM), which are the basis of two of the most active research areas in statistics and biostatistics. This research has lead to many exciting theoretical and computational developments.

If we compare the first and second editions, the most obvious change is the addition of four completely new chapters. Chapter 10 covers hierarchical generalized linear models, an important subclass of GLMM models. These models allow the researcher to deal with integer-valued outcome variables (counts, frequencies, rates, proportions). Chapter 11 adds hierarchical models for latent variables, including measurement error and item response models. In Chapter 12, the standard multilevel nesting assumption is gen-

eralized to allow for more complicated cross-classified design. Chapter 13 gives a Bayesian perspective on hierarchical models and discusses Markov chain Monte Carlo computations. All four chapters correspond with the most active research areas in multilevel analysis over the last decade and with the recent addition to the basic computer software packages (HLM and MLWin). Each chapter relaxes some of the key assumptions in the first chapters (and in the first edition), which means that, in the end, we are dealing here with an enormously larger class of models and techniques.

The Technical Appendix in the first edition has been replaced by a new Chapter 14 on estimation theory. This chapter discusses Bayesian and maximum likelihood estimation techniques and corresponding computational problems in considerable technical detail. Again, this addition covers the latest developments such as the use of Laplace approximations to the likelihood function. If we compare both editions in detail, we find hundreds of corrections and additions to the earlier chapters as well.

I have remarked elsewhere, in fact, on many occasions, that the use of hierarchical linear models may be very well established, but that many aspects of these models are not yet well understood. Thus routine application is still not here, and maybe it should never come at all. This new edition goes much deeper than the old one into questions of power, sample size, data preprocessing such as centering, and so on, which provides us with much more understanding of the basic techniques. Of course, by adding (many/much) more complicated models with equally complicated computational procedures in the new chapters, the dividing line between research and data analysis is changed again, and many more options that are even less routine are introduced. Reading this book will not make you an expert in all these different areas, but hopefully it will teach you what these options are, where to find your expert, and which questions to ask her or him.

In comparing the editions, we also note that the authors felt that their balance of work and contribution had tipped in such a way that changing the order of authorship became necessary. Thus the standard text in behavioral and social science multilevel analysis is no longer Bryk and Raudenbush (1991), but Raudenbush and Bryk (2001). For the practicing statistician in these areas, the most important question is perhaps, "Should I upgrade?" The answer is a resounding yes. You get twice as much material, from a more modern and integrated perspective, and you are introduced to some of the most exciting areas of statistical research. Moreover, many exotic and promising tools are added to your toolbox. We, the editors, are proud to have this upgrade in our series.

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