

DETAILED CONTENTS

Preface	xiii
About the Editor	xv
About the Contributors	xvii
PART I. GUIDE	1
1. Fundamentals of Hierarchical Linear and Multilevel Modeling	3
<i>G. David Garson</i>	
Introduction	3
Why Use Linear Mixed/Hierarchical Linear/ Multilevel Modeling?	5
Types of Linear Mixed Models	7
Generalized Linear Mixed Models	12
Repeated Measures, Longitudinal and Growth Models	18
<i>Repeated Measures</i>	18
<i>Longitudinal and Growth Models</i>	19
Multivariate Models	20
Cross-Classified Models	21
Summary	23
2. Preparing to Analyze Multilevel Data	27
<i>G. David Garson</i>	
Testing if Linear Mixed Modeling Is Needed for One's Data	27
Types of Estimation	28
Converging on a Solution in Linear Mixed Modeling	33
Meeting Other Assumptions of Linear Mixed Modeling	36
Covariance Structure Types	40
<i>Selecting the Best Covariance Structure Assumption</i>	44
Comparing Model Goodness of Fit With Information Theory Measures	44

Comparing Models With Likelihood Ratio Tests	45
Effect Size in Linear Mixed Modeling	47
Summary	48
3. Introductory Guide to HLM With HLM 7 Software	55
<i>G. David Garson</i>	
HLM Software	55
Entering Data Into HLM 7	56
<i>Input Method 1: Separate Files for Each Level</i>	56
<i>Input Method 2: Using a Single Statistics Program</i>	
<i>Data File</i>	57
<i>Making the MDM File</i>	57
The Null Model in HLM 7	61
A Random Coefficients Regression Model in HLM 7	67
Homogenous and Heterogeneous Full Random	
Coefficients Models	72
Three-Level Hierarchical Linear Models	81
<i>Model A</i>	84
<i>Model B</i>	85
<i>Model C</i>	87
Graphics in HLM 7	92
Summary	95
4. Introductory Guide to HLM With SAS Software	97
<i>G. David Garson</i>	
Entering Data Into SAS	97
<i>Direct Data Entry Using VIEWTABLE</i>	97
<i>Data Entry Using the SAS Import Wizard</i>	99
<i>Data Entry Using SAS Commands</i>	100
The Null Model in SAS PROC MIXED	101
A Random Coefficients Regression Model in SAS 9.2	104
A Full Random Coefficients Model	106
Three-Level Hierarchical Linear Models	110
<i>Model A</i>	111
<i>Model B</i>	112
<i>Model C</i>	115
Summary	118
5. Introductory Guide to HLM With SPSS Software	121
<i>G. David Garson</i>	
The Null Model in SPSS	121
A Random Coefficients Regression Model in SPSS 19	128
A Full Random Coefficients Model	133

Three-Level Hierarchical Linear Models	137
<i>Model A</i>	137
<i>Model B</i>	139
<i>Model C</i>	141
Summary	146

PART II. INTRODUCTORY AND INTERMEDIATE APPLICATIONS **147**

6. A Random Intercepts Model of Part-Time Employment and Standardized Testing Using SPSS	149
<i>Forrest C. Lane, Kim F. Nimon, and J. Kyle Roberts</i>	
The Null Linear Mixed Model	150
Interclass Correlation Coefficient (ICC)	151
One-Way ANCOVA With Random Effects	152
Sample	152
Software and Procedure	153
Analyzing the Data	153
Output and Analysis	156
<i>Traditional Ordinary Least Squares (OLS) Approach</i>	156
Linear Mixed Model (LMM) Approach	158
Conclusion	162
Sample Write-Up	163
7. A Random Intercept Regression Model Using HLM: Cohort Analysis of a Mathematics Curriculum for Mathematically Promising Students	167
<i>Carissa L. Shafto and Jill L. Adelson</i>	
Sample	169
Software and Procedure	171
Analyzing the Data	171
Output and Analysis	175
Concluding Results	180
Summary	181
8. Random Coefficients Modeling With HLM: Assessment Practices and the Achievement Gap in Schools	183
<i>Gregory J. Palardy</i>	
Statistical Formulations	185
An Application of the RC Model: Assessment Practices and the Achievement Gap in Schools	187
Sample	188
Software and Procedure	190

Analyzing the Data	191
Output and Analysis	193
Conclusion	199
<i>Baseline Model</i>	199
<i>Student Model</i>	200
<i>School Model</i>	201
9. Emotional Reactivity to Daily Stressors Using a Random Coefficients Model With SAS PROC MIXED: A Repeated Measures Analysis	205
<i>Shevaun D. Neupert</i>	
Sample and Procedure	206
Measures	206
Equations	207
SAS Commands	208
Structural Specification	208
Model Specification	209
Unconditional Model Output	210
Interpretation of Unconditional Model Results	212
Random Coefficients Regression Model	212
Random Coefficients Regression Output	213
Interpretation of Random Coefficients Regression Results	217
Conclusion	217
10. Hierarchical Linear Modeling of Growth Curve Trajectories Using HLM	219
<i>David F. Greenberg and Julie A. Phillips</i>	
The Challenges Posed by Longitudinal Data	219
The Hierarchical Modeling Approach to Longitudinal Data	221
Application: Growth Trajectories of U.S. County Robbery Rates	224
<i>Exploratory Analyses</i>	225
<i>Estimation of the Linear Hierarchical Model</i>	226
<i>Modeling the Variability of the Level 1 Coefficients</i>	232
<i>Residual Analysis</i>	236
<i>Estimating a Model for Counts</i>	239
Assessment of the Methods	243
11. A Piecewise Growth Model Using HLM 7 to Examine Change in Teaching Practices Following a Science Teacher Professional Development Intervention	249
<i>Jaime L. Maerten-Rivera</i>	
Sample	250
Software and Procedure	252
Analyzing the Data	254
<i>Preparing the Data</i>	254
<i>HLM Data Analyses</i>	255

Output and Analysis	257
<i>Examination of Time</i>	257
School as a Level 2 Predictor	262
Alternative Error Covariance Structures	264
Conclusion	269
<i>Discussion of Results</i>	269
<i>Limitations of the Study</i>	270
12. Studying Reaction to Repeated Life Events With Discontinuous Change Models Using HLM	273
<i>Maike Luhmann and Michael Eid</i>	
Sample	276
Software and Procedure	277
Analyzing the Data	277
<i>Preparing the Data</i>	278
<i>Analytic Model</i>	279
Output and Analysis	283
Conclusion	287
13. A Cross-Classified Multilevel Model for First-Year College Natural Science Performance Using SAS	291
<i>Brian F. Patterson</i>	
Sample	292
<i>Predictors</i>	293
Software and Procedure	294
Analyzing the Data	297
<i>Evaluating Residual Variability Due to the Cross-Classified Levels</i>	297
<i>Specifying a Covariance Structure</i>	299
<i>Building the Student-Level Model</i>	299
<i>Building the College- and High School-Level Models</i>	300
<i>Evaluating Model Fit</i>	300
Output and Analysis	301
<i>Evaluating Residual Variability Due to the Cross-Classified Levels</i>	301
<i>Specifying a Covariance Structure</i>	302
<i>Building the Student-Level Model</i>	303
<i>Evaluating Model Fit</i>	305
<i>Evaluating Residual Variability in the Final Model</i>	305
Conclusion	306
<i>Interpreting Fixed Parameter Estimates</i>	306
14. Cross-Classified Multilevel Models Using Stata: How Important Are Schools and Neighborhoods for Students' Educational Attainment?	311
<i>George Leckie</i>	
Sample	312

Software and Procedure	315
Analyzing the Data	316
Output and Analysis	319
Conclusion	330
15. Predicting Future Events From Longitudinal Data With Multivariate Hierarchical Models and Bayes' Theorem Using SAS	333
<i>Larry J. Brant and Shan L. Sheng</i>	
Sample	336
Software and Procedure	337
Analyzing the Data	344
Output and Analysis	344
Conclusion	350
Author Index	353
Subject Index	357