Course in multilevel analysis for grouped and longitudinal data

by

Joop Hox
Utrecht University

Social research often concerns relationships between individuals and the social contexts to which they belong. Individuals and their social contexts can be conceptualized as a hierarchical structure, with individuals nested within groups. Classical examples are educational research, with pupils nested within schools, and cross-national research, with individuals nested within their national units. Such systems can be observed at two levels, and as a result we have data with group level variables and individual level variables. To analyze such hierarchical structures, we need multilevel modeling, which allows us to study the relationships between variables observed at different levels in the hierarchical structure.

Multilevel modeling can also be used to analyze data from longitudinal research, by viewing measurement occasions as being nested within respondents. This has several advantages compared to more classical approaches to longitudinal data. In addition, multilevel models have been generalized to cover situations where data do not have a simple multilevel structure, such as cross-classified data or multiple-membership models.

This short course is intended as a basic and nontechnical introduction to multilevel analysis. It starts with a description of some examples, and shows why multilevel models are necessary if the data have a hierarchical structure. It then covers the basic theory of two- and three-level models. Next it explains how multilevel models can be applied to analyzing longitudinal data, and why and when this may be an attractive analysis approach, as compared to more classical analysis methods such as multivariate analysis of variance (Manova). Further topics are multilevel logistic models to analyze data where the outcome variable is dichotomous or a proportion, and multilevel multivariate modeling to analyze where there are multiple outcome variables.
The course includes three computer labs, where multigroup and longitudinal data are analyzed. The computer labs in the course use the SPSS Mixed procedure, which is available in SPSS starting with version 11.5. The course assumes reasonable familiarity with analysis of variance and multiple regression analysis, but prior knowledge of multilevel modeling is not assumed.


---

### Time Schedule Summer School:

<table>
<thead>
<tr>
<th>Time</th>
<th>Thursday 28.09</th>
<th>Friday 29.09</th>
<th>Saturday 30.09</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.30</td>
<td>Lunch Break</td>
<td>Lunch Break</td>
<td></td>
</tr>
<tr>
<td>14.00</td>
<td>Lecture: Two-and three level models</td>
<td>Lecture: Analyzing categorical data</td>
<td></td>
</tr>
</tbody>
</table>
Joop Hox is Professor of Social Science Methodology at the department of Methodology and Statistics of the Faculty of Social Sciences at Utrecht University. As Methodology chair, he is responsible for the research, development and teaching carried out at the faculty in the field of social science methods & techniques.

His research interests focus on two lines of work: data quality in social surveys and multilevel modeling. In survey methodology, he has written articles on nonresponse problems and the effects of data collection mode and interviewers on various aspects of data quality. In multilevel modeling, he has written numerous articles, book chapters, and an introductory handbook, with a newly written monograph currently in press. The two lines of research reinforce each other, for instance in using multilevel methods to model complex survey data. He has acted as coordinator for a large international study of interviewer effects on nonresponse, which combines interviewer and respondent-level data from 32 surveys carried out in nine different countries.

He graduated from the Psychological Methods department at the Faculty of Psychology of the University of Amsterdam (doctoral degree 1977; Ph.D. 1986). He was a Fulbright scholar at the Program on Social Statistics at UCLA in 1990. He worked as associate professor at the Faculty of Education at the University of Amsterdam. At present he is full professor at Utrecht University. In addition to undergraduate and graduate courses, he teaches at the international University College Utrecht.

Joop Hox has taught postgraduate courses on missing data problems at the Max Planck Institute (Berlin, 2001) and at the Zentral Archiv (Köln, 1999). He also taught postgraduate courses on multilevel modeling at the ISR Summer School (Ann Arbor, USA, 2000, 2001), the Swiss Institute for Alcohol and Drug Research (Lausanne, 1998), the Max Planck Institute (Berlin, 1997), LLWB
longitudinal modeling workshop (Potsdam, 1997), and the Instituto Europeano (Florence, 1995). He has been invited speaker, a.o., at the NISS Survey Quality workshop (Washington, DC, 2005), at the 1997 Conference of the German Gesellschaft für Klassifikation (Potsdam, 1997), at the Conference of the Society of Multivariate Analysis in the Social and Behavioral Sciences (Leuven, BE, 1996), and at the American Statistical Association Conferences on Survey Measurement and Process Quality (Bristol, UK, 1995) and on Measurement Errors in Surveys (Tucson, USA, 1990). He is a long-standing and active member of the International Workshop on Household Survey Nonresponse.

Throughout his career at Utrecht University, and before that at the University of Amsterdam, Joop Hox has maintained an active research program in both survey methodology and multilevel modeling. He is a member of the editorial board of *Structural Equation Modeling* and *Using Statistics*. He has acted as reviewer for national and international journals in the fields of survey methodology and statistics, and has been guest editor for special issues. He has written numerous publications, organized workshops and conferences, and edited several books. His recent publications focus on survey nonresponse, interviewer effects, survey data quality, missing data problems, and multilevel analysis of regression and structural equation models.

A list publications since 2000 is given below. A complete list of publications, some of which available online, can be found on his website at http://www.fss.uu.nl/ms/jh.


**Books**


Articles


