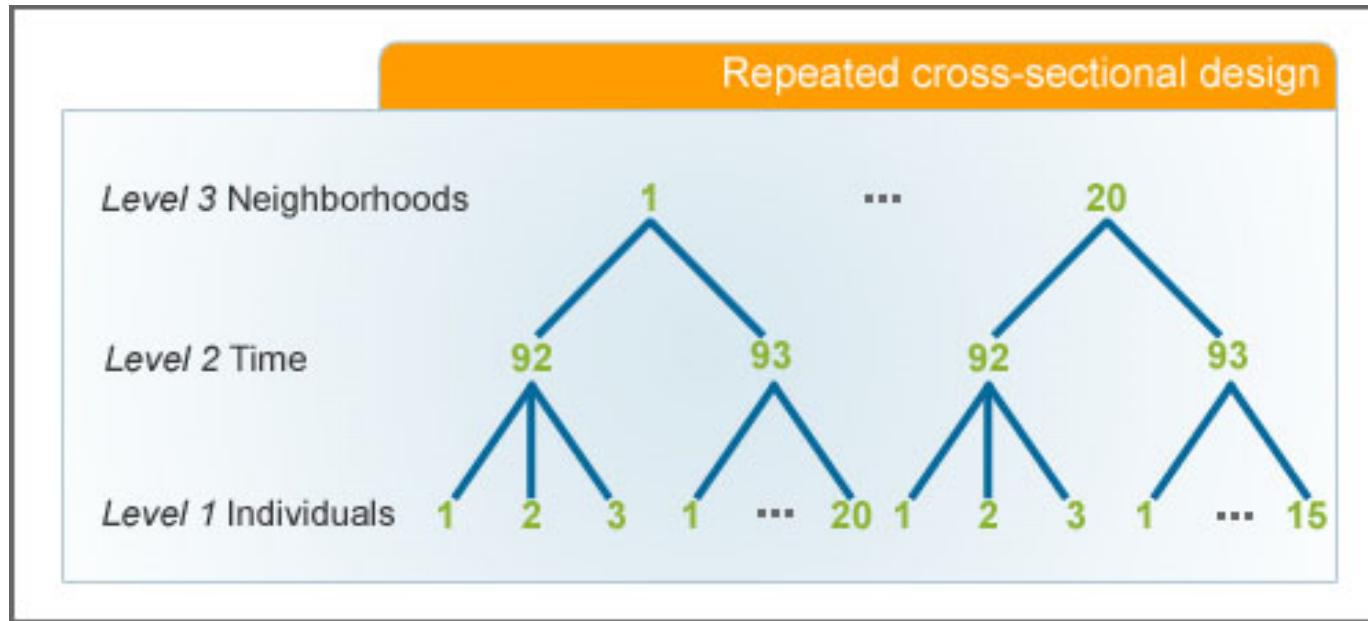


Multilevel data structures

Strict hierarchies

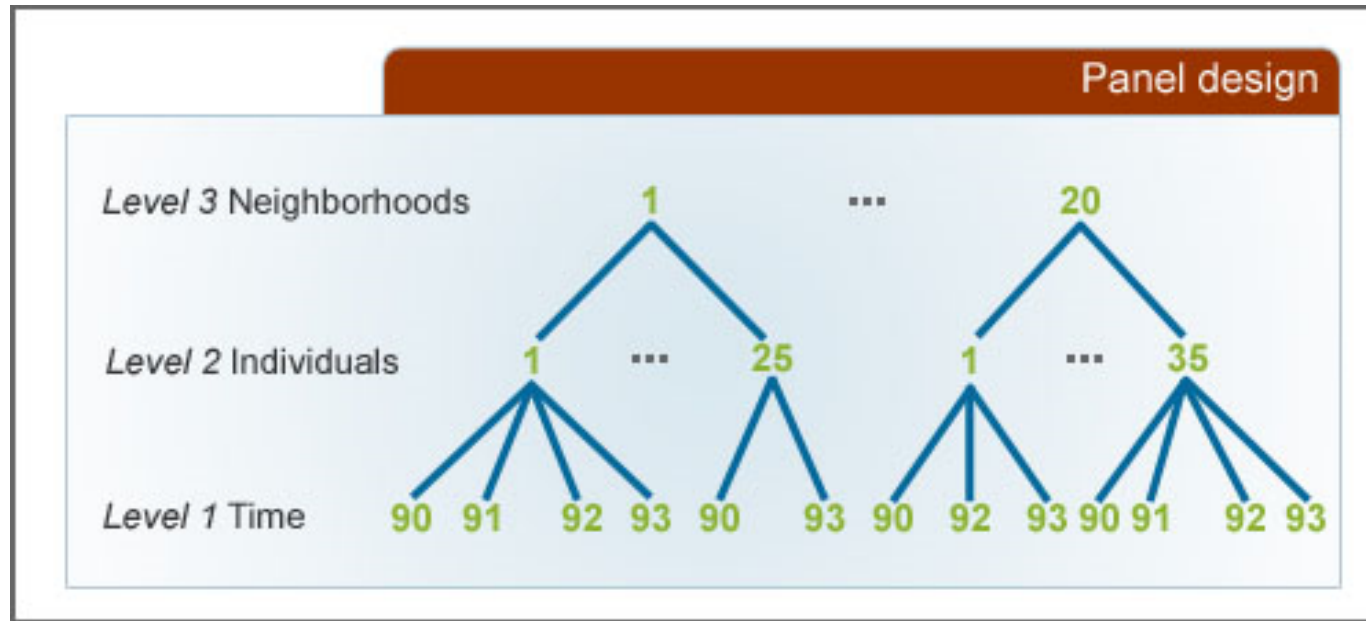


Repeated cross-sectional design



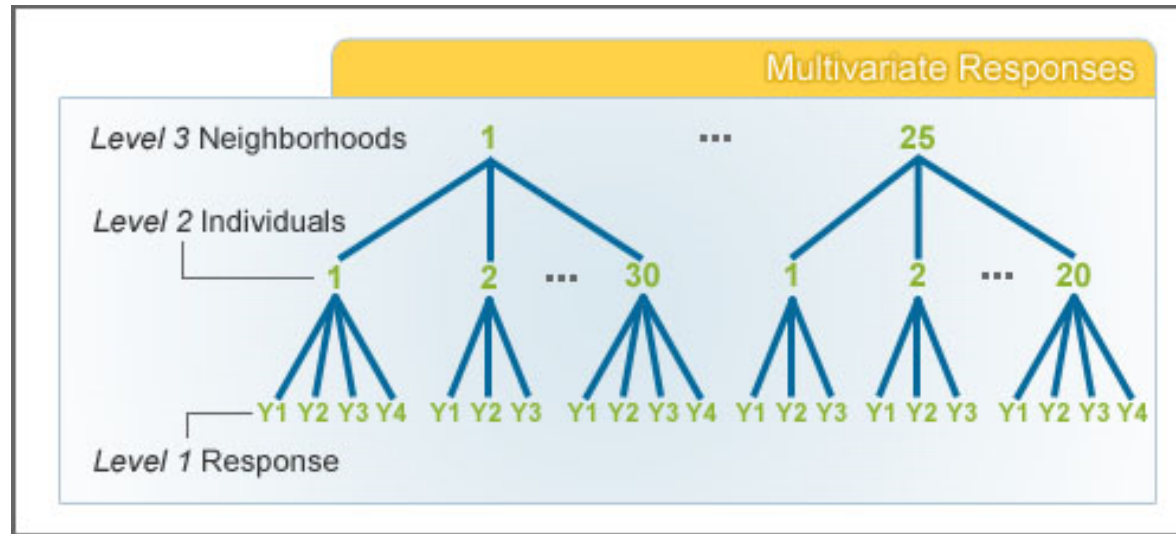
- Structure:
 - Level-3 is the areas, level-2 is the year and level-1 is the individual. Level-2 represents repeated measurements on the school.
- Question
 - What is happening to area-based differences in mortality over time, after taking account of the changing composition of these areas?
 - Are the changes in area-variation over time different for different population groups?

Repeated measures design



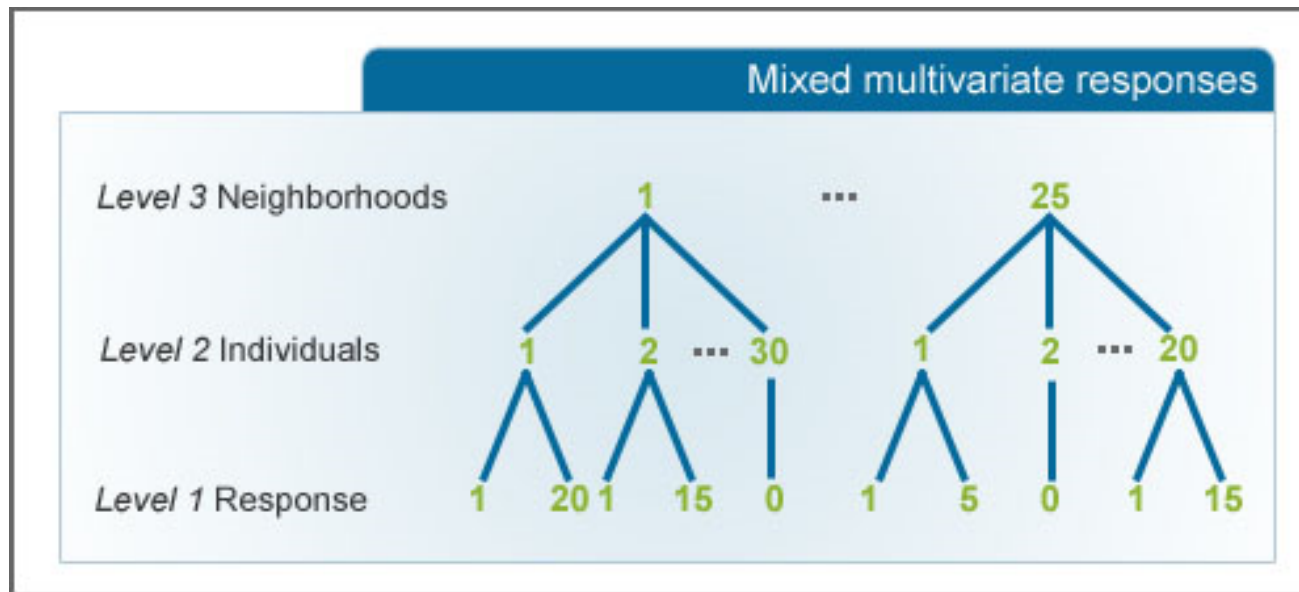
- Structure:
 - Level-3 are areas, level-2 are individuals and level-1 is time. Individuals repeatedly measured: same individuals.
- Question
 - Growth curve modeling of individuals
 - Survival, Event duration models, Discrete time series

Multivariate multilevel structures



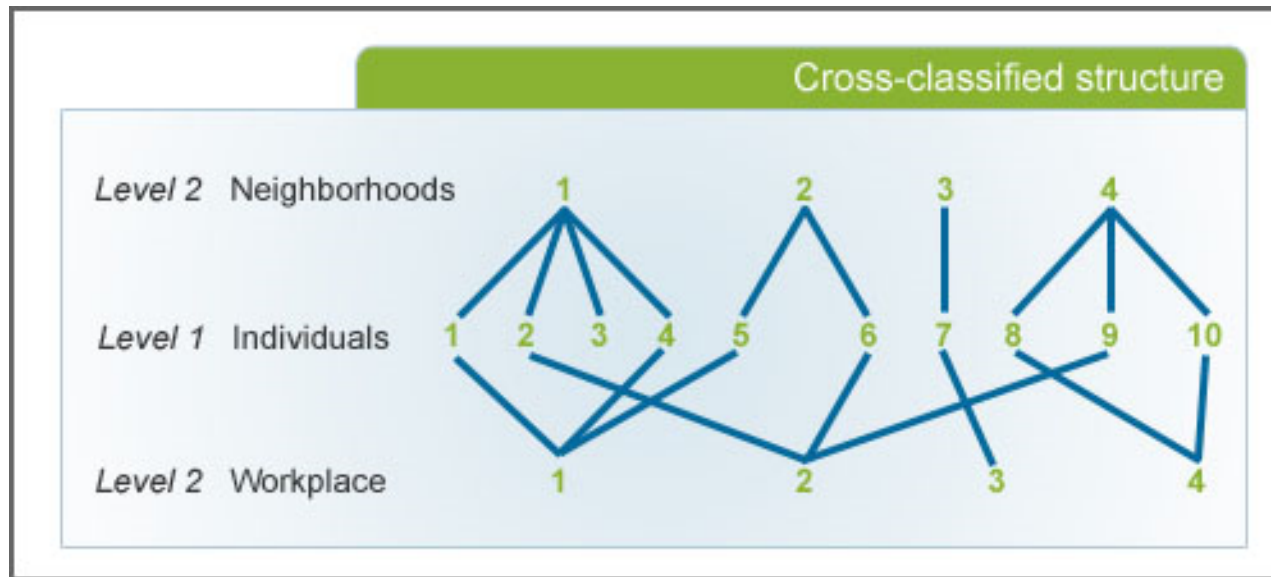
- Structure:
 - Multiple response variables, representing repeated measurements of distinctive but not unrelated outcome variables;
 - Group of response variables (level-1) nested within individuals (level-2) nested within neighborhoods (level-3)
- Question
 - Is the gender difference for the different measures?
 - Are neighborhoods that are high for one outcome, high (or low) for the others, accounting for 'composition'?

Mixed multilevel structures



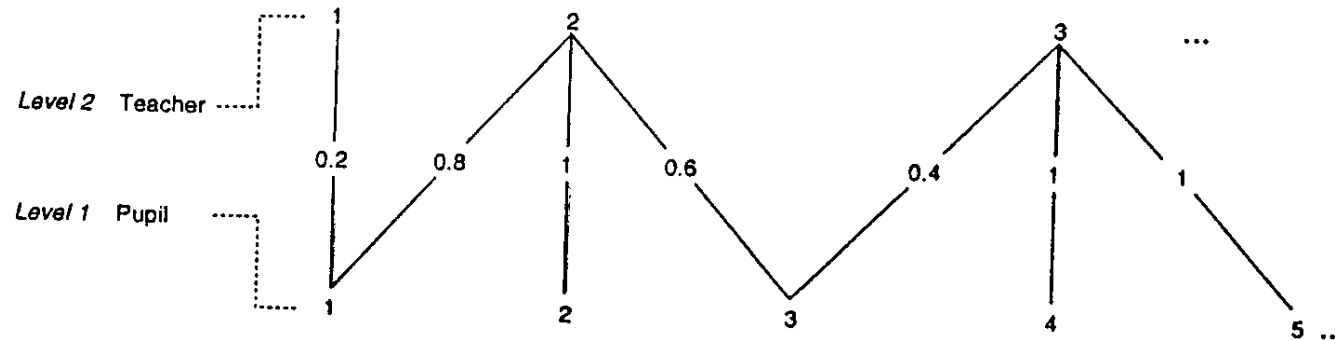
- Structure:
 - Level-3: Places; Level-2: Individuals; Level-1: Two responses:
 - 1) smoke or not (a qualitative state)
 - 2) how many cigarettes they consume in a day (a quasi continuous measure)
- Question
 - Gender related to whether you smoke or not; but unrelated to the amount you smoke?
 - Are neighborhoods that have a high proportion of smokers also tend to have higher smoking intensity?

Cross-classified structures



- Structure:
 - Individuals at level-1 in Workplaces at level-2 AND Neighborhoods at level-2
 - Workplaces and neighborhoods are not nested but CROSSED.
 - Individuals are seen as occupying more than one set of contexts.
- Questions:
 - Relative contribution of neighborhoods and workplaces.

Multiple membership structures



- Structure:
 - Pupils nested within primary school-teachers
 - Some pupils are taught by more than one teacher
 - Structure includes a 'weight' based upon the proportion of time the pupil spent with the teacher.

Repeated Measures Spatial Multilevel Model with Multiple Membership

