

Data Classification Patterns

Data can be organized in two types of classification patterns, crossed or nested. It is important to be able to identify these classification patterns because they affect the definition of your model. Let's look at each pattern.

When two factors are crossed, observations are collected for each combination of each level of the two factors. In this school example, the two crossed effects are **Gender** and **School**. Observations are collected for students in each level of **Gender** (M and F) and of **School** (Cottonwood and Dogwood). As you can see, each level of one factor can occur with each level of the other factor: females at Cottonwood, females at Dogwood, males at Cottonwood, and males at Dogwood.

In nested classification, the factors are nested, that is, classified hierarchically. As shown in this school example, the samples are typically taken in several stages in nested classification. First, the main units are selected. In this example, the main units are two levels of the first factor, **School**—that is, Cottonwood and Dogwood. Then, the sub-units are selected from each main unit. Here, for each school, sub-units are selected from the second factor, **Class**. That is, two classrooms from each school are selected. Although the selected classrooms are numbered 1 and 2 for both schools, these cannot possibly be the same classrooms across schools. If you used a different numbering system for the classes at Dogwood for example, the analysis and the results would not change. Finally, the sub-sub-units are selected from each sub-unit. Here, observations for specific students are selected from each classroom in each school. Although no further nesting occurs in this example, other examples might have a higher degree of nesting. The classification factors at each stage are typically considered random effects. In some cases, factors at the first stage of sampling might be considered fixed. For example, **School** would be fixed if Cottonwood and Dogwood were the only two schools of interest in the study.