Pre-lecture Notes IV.4 - Interrupted Time-series Designs

The last type of complicated design that we'll discuss is also used in applied settings – when you are testing the efficacy of some treatment on a large number of people. This design is also almost always used when many subjects are being treated and testing at the same time. In fact, these designs are used when the treatment is being applied to everyone in a certain population, even those who will not be measured. These are sometimes called "mass interventions" because a large number of people are being influenced all at once.

A typical example would be when a university tests the efficacy of a new anti-binge-drinking program. The program affects everyone at the university (at the same time), since it usually involves posters and advertisements in the school paper. The data are collected by taking surveys on drinking behavior. Not everyone is sampled in the surveys, so this is a case where more people get the treatment than those who are "in" the experiment.

The key problem facing this type of experiment is that many things can change during the time that the treatment is being given. So, you cannot simply take a pre-measure of binge-drinking, give the treatment, and then take a post-measure and look for a decrease in the unwanted behavior. Before vs after the treatment is confounded with earlier vs later in time. And you can't counter-balance the before vs after measures, since the hope is that the treatment will have a permanent effect, so once the subjects have had the treatment, they can never be in the "control" condition.

Two different approaches are taken in trying to deal with this automatic confound between before vs after and earlier vs later. One approach, which is where this general method gets its name, is to get a series of measure over time, both before and after the treatment, to get a general feel for the effects of time on the behavior. Then one looks for an "interruption" in this series of measures at the exact moment that the treatment was given. Any interruption to the general pattern of results across time is taken as a measure of the treatment's effect.

The second approach tries to deal with the possibility that a special event, by random bad luck, occurred at the same moment that the treatment was given. This is done in two ways, which correspond to the fifth method of dealing with confounds that we saw back in the last part of the course, plus the new version of the third method that we saw on Tuesday. You either add a control group (somewhere else, unaffected by the treatment) to get a measure of the effects of wide-spread events that just happen to occur during your study, and/or you have a control measure in your original subjects to pick up the effects of local events that happen to occur at the same time as your experiment.

The ultimate method for testing the efficacy of a mass intervention is to use all three of these tricks at once. This is the design that we will discuss in detail in class.