

Practical Stats Newsletter for March, 2005

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2. Designing your study: paired observations
3. New versions of NADA software freely available for download

1. Register for "Applied Environmental Statistics" soon
March 21-25, 2005 Colorado School of Mines
Golden, Colorado

Our 1-week survey of applied statistics. How to "make sense of your data". Registration is online through PracticalStats.com. March is the snowiest month in the Denver area. Skiing is great just an hour or less into the mountains from Golden. COURSE RATES INCREASE NEXT MONDAY. Register now!

2. Designing your study: Paired observations

Environmental studies are usually "uncontrolled experiments". Comparisons of concentrations to look for differences before and after a major change to the system inevitably are confounded with the early period being dry, and the later period very wet. Or something similar. Many possible uncontrolled effects are unaccounted for. The result is that the cause of observed differences is often unclear. Are the observed differences due to the monitored change, or to the difference in precipitation? How can we tell?

One of the ways to control unwanted factors is with paired comparisons. Observations of two conditions, both subject to all environmental variables, but only one with the targeted effect, are sampled. For example, paired watersheds, one with a new farming practice and one without, are located close enough to reflect the same precip and climate. Effects due to climate show in the control watershed. Only differences over and above those observed at the control site can be attributed to the change in farming practice.

Pairing is often beneficial in ground water studies as well. Decreasing concentrations with depth to the well may make it difficult to determine whether two sampling devices, one now used and another being considered to replace it, give the same results. Sampling one set of wells with one device, and another with the second device, allows uncertainty in the cause of observed differences to creep into the study. Are differences due to the sampling devices, or to the different set of wells being

sampled?

By sampling the same set of wells with each device, that uncertainty is removed. Pairing is accomplished by sampling at the same locations, blocking out unwanted differences not due to the test of sampling devices.

Designing your study up front, taking advantage of possibilities for matching sets of observations, reduces the likelihood of not knowing to what to attribute observed results at the end of the study. Methods for analysis of matched pairs of data are available in every major statistics package. We discuss these methods in both of the courses we currently teach. The paired t-test and signed-rank tests are presented and contrasted

in our Applied Environmental Statistics course (coming up later this month). Discussions include when you would choose to use one over the other.

For data with one reporting limit, the sign test, probably the oldest known hypothesis test, works very well. For data with multiple reporting limits, the Paired Prentice Wilcoxon (PPW) test is presented in our "Less Than Obvious"

training course, and in the NADA textbook. Determinations of whether one group is producing higher numbers than the other can be made on paired data using PPW without substituting any artificial values for nondetects.

Pairing observations is a powerful tool for getting more control over "uncontrolled experiments". Learn how to take advantage of matched pairs, and how to analyze their results, in one of our training courses.

3. New versions of NADA software freely available for download

The new textbook "Nondetects And Data Analysis: Statistics for censored environmental data" (Helsel, 2005) comes with Minitab macros to perform all procedures listed in the book. Improvements have been made since the versions released with the book last October. The newest version is always online at the NADA website:

<http://www.practicalstats.com/nada>

If you haven't recently, download and install the newest versions. Check back occasionally for updates. For those of you who haven't seen it yet, NADA covers methods for handling data with nondetects. Methods include computing summary statistics, UCL95s, hypothesis testing and correlation/regression. Published by Wiley, and available for order at your favorite online or local bookstore.

'Til next time,

Practical Stats

<http://www.practicalstats.com>

-- Make sense of your data