

Citation Classics

Kramer C Y. Extension of multiple range tests to group means with unequal num-bers of replications. *Biometrics* 12:307-10, 1956.

The author shows how means with unequal numbers of replications can be grouped into homogenous subgroups to determine which means are different from other means. [The SCI® indicates that this paper was cited 539 times in the period 1961-1975.]

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February 2, 1977

"It is indeed an honor and both extremely satisfying and flattering to be a most cited author. To have a statistical paper in the list of most cited papers certainly shows the utility of statistical methods in all subject matter fields. This paper, as most of my many papers, was written because there were researchers in all subject matter areas facing this problem.

"As an Experiment Station Statistician, my primary duties were to consult with research workers in all areas. This included talking over the proposed research, providing the optimum statistical design or sampling plan, analyzing the results, and helping the research worker interpret his results. Most of the time the experiments were set up to have an equal number of observations on each treatment, but about as many times as not when the data came in for analysis there

were missing observations. The missing observations were caused by I guess you could say 'Mother Nature' because any research conducted is merely a game against Mother Nature.

"Many papers dealt with grouping equal means but these were no help to my clients and, of course, one could not just compare two treatments at a time by a student t-test, so I began to work on the problem. After many approaches I found a very simple relationship that turned out to give very satisfactory results.

"Before I published the paper, I took many experiments in all areas that had equal numbers and at random deleted observations in the treatments and applied my new procedure. I found that only in a very few instances did the groupings change, which was very gratifying. This was during the time when one only had desk digital calculators and it was very time consuming but I felt necessary.

"The procedure proved very easy to use and from the number of citations, I guess it was just what the subject matter people needed to draw their inferences. It is now incorporated as a procedure in Statistical Analysis System 1976 and probably will continue to be used more and more.

"I think of myself as an applied statistician and a consultant, in that I work on problems that have been brought to me by my clients. The researcher workers at Virginia Polytechnic Institute and State University should share in this honor because they are the ones that brought the problem to my attention and published their results using my method even before I published the paper."