

A RANK-SUM TEST FOR CLUSTERED DATA WHEN THE NUMBER OF SUBJECTS IN A GROUP WITHIN A CLUSTER IS INFORMATIVE

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Abstract

The Wilcoxon rank-sum test is a popular nonparametric test for comparing two independent populations (groups). In recent years, there have been renewed attempts in extending the Wilcoxon rank sum test for clustered data, one of which [1] addresses the issue of informative cluster size, i.e., when the outcomes and the cluster size are correlated. We are faced with a situation where the group specific marginal distribution in a cluster depends on the number of observations in that group (i.e., the intra-cluster group size). We develop a novel extension of the rank-sum test for handling this situation. We compare the performance of our test with the Datta-Satten test, as well as the naive Wilcoxon rank sum test. Using a naturally occurring simulation model of informative intra-cluster group size, we show that only our test maintains the correct size. We also compare our test with a classical signed rank test based on averages of the outcome values in each group paired by the cluster membership. While this test maintains the size, it has lower power than our test. Extensions to multiple group comparisons and the case of clusters not having samples from all groups are also discussed. We apply our test to determine whether there are differences in the attachment loss between the upper and lower teeth and between mesial and buccal sites of periodontal patients.

Keywords: correlated data, dental data, nonparametric tests, Wilcoxon rank-sum test, within-cluster resampling

References

- [1] Datta S., Satten G. A. (2005). Rank-Sum Tests for Clustered Data. *Journal of the American Statistical Association*. Vol. **471**, pp. 908–915.