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The study of tests of censoring of extreme sample values has been the major research topic. In contrast to earlier work, aimed at evaluating the effect of using specific inaccurate estimates of population distributions, attention has been concentrated on finding how little information suffices to make tests feasible. In particular, it has been found that one complete sample, of size comparable to that of a suspected incomplete sample, and known to be from the same population, makes possible a fairly powerful test. Even when it is only known that some samples, out of two or more, are complete, it is possible to construct useful tests. The work was also concerned with extreme values, and the use of order statistics in estimating ratios - a technique which can also be applied to censored samples.

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EFFECTS AND DETECTION OF SELECTIVE MODIFICATIONS IN SAMPLES: MULTIVARIATE MODELS AND TECHNIQUES

N.L. Johnson
Principal Investigator

Final Report

September 1977

U.S. ARMY RESEARCH OFFICE
Research Triangle Park, N.C.

DAAG29-74-C-0030

UNIVERSITY OF NORTH CAROLINA

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FINAL REPORT ON "Effects and Detection of Selective Modification in Samples: Multivariate Models and Techniques"

PARTICIPATING SCIENTIFIC PERSONNEL

Norman L. Johnson, Principal Investigator		1974-7
Joseph J. Walker (Ph.D. 1976)	Graduate Assistants	1974-5
Carlos B. Segami (Ph.D. 1976)		1974-6
S. Lynne Stokes (Ph.D. 1976)		1974-6
C.F. Hsu (Ph.D. 1977)		1975-7
Marva H. Moore		1977
Helen P. Bhattacharyya		1976-7
Robert N. Rodriguez		1976-7
Douglas Hawkins		1976-7

The study of tests of censoring of extreme sample values has continued to be a major research topic of the Principal Investigator. In contrast to earlier work, aimed at evaluating the effect of using specific inaccurate estimates of population distributions, attention has been concentrated on finding how little information suffices to make tests feasible. In particular, it has been found [3] that one complete sample, of size comparable to that of a suspected incomplete sample, and known to be from the same population, makes possible a fairly powerful test. Even when it is only known that some samples, out of two or more, are complete, it is possible to construct useful tests [18].

The work of Hawkins [16] is also concerned with extreme values, and Bhattacharyya [1] discusses the use of order statistics in estimating ratios - a technique which can also be applied to censored samples.

In collaboration between S. Kotz and the Principal Investigator, the following research results have been obtained.

(i) Generalizations of the Farlie-Gumbel-Morgenstern distributions, both to a general number of variables [5] and by iteration to construct new systems [6], [7].

(ii) New multivariate distributions associated with generalized occupancy

models have been developed [8], [11].

(iii) A new model for hierarchal (multi-stage) replacement from an aging supply has been formulated and relevant methods of analysis indicated [19].

Segami [21] has studied systems of distributions which are "dual" to each other, in the way that Poisson and gamma distributions are related.

Using methods similar to those employed earlier by S. Kotz and the Principal Investigator in discussing power transformations of gamma variables, Rodriguez [13] has given an exhaustive summary of the Burr Type XII distributions.

Walker [23] has solved some distributional problems arising in cluster analysis.

The Principal Investigator's work on tests for mixtures has been systematically extended to a much broader field by Hsu [20] who enumerates 25 classes of problems and gives detailed analyses for about five of these classes.

Stokes [22] has explored the consequences of using rank-order sampling. This is a technique for using relatively cheap observations to help decide which individuals should be subjected to relatively expensive forms of measurements. Stokes also considered modifications of the technique, and its applicability to measures of dispersion as well as location (to which it had previously been restricted).

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