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SEMI-ANNUAL PROGRESS REPORT NO. 6

AND

FINAL REPORT

"Estimation and Testing of Parameters of Distributions by Order Statistics"

University of North Carolina

Chapel Hill, North Carolina

Period Covered: October 1, 1962 through March 31, 1963

Final Report: April 1, 1960 through March 31, 1963

Chief Investigator: Bernard G. Greenberg, Department of Biostatistics

GRANT NUMBER: DA-ORD-7
2776-M

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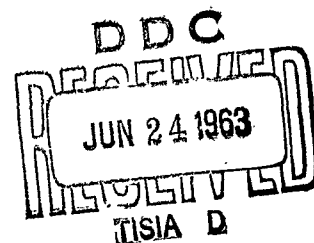
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I. Fulfillment of Objectives

A. Reports and Publications

1. Technical Report #12 (June 1, 1960) - Not published.

    "A Non-Parametric Comparison of Two Samples One of Which is
    Censored" by John G. Saw.

2. Technical Report #13 (July 15, 1960) - Biometrika, Vol. 47,
                                                        Nos. 1 and 2, 1960, pp. 79-86.

    "A Note on the Error after a Number of Terms of the David and
    Johnson Series for the Expected Value of the r-th Smallest of
    n Ordered Normal Variates" by John G. Saw.

3. Interim Technical Report No. 1 (August 15, 1960) - Annals Mathe-
                                                      matical Statistics, Vol. 34, No. 1,
                                                      March 1963, pp. 102-116.

    "Simplified Estimates for the Exponential Distribution" by
    A. E. Sarhan, B. G. Greenberg and Junjiro Ogawa.

4. Interim Technical Report #2 (August 25, 1960) - Biometrika, Vol. 48,
                                                     Nos. 3 and 4, 1961, pp. 448-451.

    "The Bias of the Maximum Likelihood Estimates of the Location
    and Scale Parameters Given a Type II Censored Normal Sample"
    by John G. Saw.

5. Interim Technical Report #3 (August 31, 1960) - Biometrika,
                                             Vol. 48, Nos. 3 and 4, 1961,
                                             pp. 367-377.

    "Estimation of the Normal Population Parameters Given a Type I
    Censored Sample" by John G. Saw.

6. Interim Technical Report #4 (February 25, 1961) - Abstract
                                                        published.

    "Nearly Best Linear Estimates" by Carl-Erik Sarndal.

7. Interim Technical Report #5 (April 3, 1961) - Arkiv för Matematik,
                                                   Band 4, Nr 29, 1961, pp. 385-392.

    "On a Maximizing Problem with Several Applications in Statistical
    Theory" by Carl-Erik Sarndal. Abstracted in Mathematical Reviews,
                                             Vol. 25, No. 4, April 1963, p. 699.

8. Interim Technical Report #6 (November 15, 1961) - Published as
                                                   monograph in "Information From
                                                    Censored Samples", Almqvist and
                                                    Wiksell, Stockholm, 1962, 120 pages.

    "Loss of Information in Estimation from Incomplete Samples"
    by Carl-Erik Sarndal.

9. Contributions to Order Statistics, by A. E. Sarhan and B. G. Greenberg, John Wiley and Sons, New York, N. Y., Sept. 1962, 482 pages.

10. Interim Technical Report #7 (December 1, 1962) - Being submitted to Technometrics.

   "Nearly Optimum Spacings for Estimating the Parameters of the Gamma Distribution" by Carl-Erik Sarndal.

B. Current Period (September 1, 1962 through March 31, 1963)

1. Dr. Sarhan was on leave in Egypt during this entire period. Dr. Greenberg had heavy teaching and administrative duties and did no new research during this period. He followed through in getting Interim Technical Report #1 published in March 1963 issue of Annals of Mathematical Statistics, and supervised the work of Dr. Sarndal. In addition, he continued to negotiate for the services of Dr. M. N. Ghosh, India, to work on this project. He also supervised the doctoral dissertation of Mr. Khatab Hassanein whose work is described below.

2. Dr. Carl-Erik Sarndal resumed full-time employment on this project in the summer of 1962. His research involved an investigation into the efficiency and loss of information in censoring and with grouped data. He also worked on the development of nearly optimum estimates for the Gamma distribution.

   This research has produced excellent results and is being finished under the new, continuing grant DA-31-124-ARO(D)-G432. A manuscript is being prepared for submission to Annals of Mathematical Statistics under the title, "Some New Aspects of Estimation from Grouped Samples and Type I Censored Samples." A technical report will not be issued on this research unless publication is delayed.

   Another paper being readied for submission to the Journal American Statistical Association is "A Unified Derivation of Some Parameter-Free Distributions." This will also be distributed as a reprint, if accepted, rather than as a technical report.

3. Mr. Khatab Hassanein has finished his doctoral dissertation on nearly best linear estimates in specified distributions under various conditions of censoring. This will be issued as a technical report under the new grant and a smaller, condensed version will be used for submission to either Annals of Mathematical Statistics or Journal American Statistical Association.

C. Future Work

1. Plans are to continue the research outlined in grant proposal DA-31-124-ARO(D)-G432.

2. A postdoctoral fellow has been employed as of April 1, 1963 (Charles Roberts) to work on the problem of estimating minimum life and average life in the rectangular distribution when the sample is based upon n series of first failures among k simultaneously observed objects.

II. Personnel

A. The personnel who have served on this project for varying periods of time are:

Bernard G. Greenberg
Ahmed E. Sarhan
Junjiro Ogawa
Bernard Pasternack
John G. Saw
Carl-Erik Sarndal
Khatab Hassanein

III. Fiscal   (See attached table)

III. Fiscal

Item	Total budgeted*	Expenditures			Remainder
		Previous Periods	Current Period**	Total to Date	
1. Salaries and wages		$17,067.52	$4,200.00	$21,267.52	
2. Supplies and printing		1,053.97	35.37	1,089.34	
3. Travel		772.61	None	772.61	
4. Communications and shipping		111.33	1.20	112.53	
Subtotal	$23,750.00	$19,005.43	$4,236.57	$23,242.00	$508.00
5. Overhead (at 20% of subtotal)	4,750.00	3,801.08	847.32	4,648.40	101.60
6. Grand total	$28,500.00	$22,806.51	$5,083.89	$27,890.40	$609.60

* April 1, 1960 through March 31, 1963.

** October 1, 1962 through March 31, 1963.