

APPENDIX A

SAMPLING AND ESTIMATION PROCEDURES

Sampling Procedure

The sampling frame was extracted from the 1982 National Center for Educational Statistics' HEGIS list which also gave Fall 1982 enrollments. The population frame consisted of those 2-year colleges, 4-year colleges or universities in the U.S.A., the District of Columbia or Puerto Rico that offered undergraduate Mathematics courses. There was a total of 2463 such institutions.

The population was divided into 22 strata on the basis of Control (Public or Private), Type (University, 4-year college or 2-year college) and Fall 1982 enrollment. This stratification is similar to but simpler than the one used for the 1980-81 CBMS study. Standard sampling techniques were used to determine the sample size for each stratum and then a random sample of institutions was chosen from each stratum.

Since the Stratification was based on enrollment, large schools were sampled much more heavily than small schools. Table A-1 gives a summary of the stratification.

Addresses were determined for sampled schools with the main sources of addresses being the 1985 Mathematical Sciences Administrative Directory and the 1985 Community, Technical, and Junior College Directory.

TABLE A - 1

NUMBER OF INSTITUTIONS IN EACH CONTROL/TYPE STRATUM
AND SAMPLE SIZE IN EACH STRATUM

Control/Type	# of Strata	Population	Sample
Public Universities	4	95	46
Private Universities	3	62	26
Public 4-Year Schools	4	427	105
Private 4-Year Schools	4	839	80
2-Year Schools	<u>7</u>	<u>1040</u>	<u>172</u>
Total	22	2463	429

Appropriate questionnaires were sent to all Mathematics Departments in the sampled institutions or to the Division in charge of Mathematics courses. In addition questionnaires were mailed to all Computer Science, Statistics or other Mathematical Sciences Departments that were determined to exist at the sampled schools. Two-year colleges had a different questionnaire than the other schools. In addition, two short questionnaires dealing with remedial Mathematics and Computer Science were mailed to appropriate departments. The questionnaires are discussed in more detail in the report and copies of all questionnaires are found elsewhere in Appendices B to D.

Table A-2 summarizes the population and sample sizes for the separate Computer Science and Statistics Departments in four-year colleges and universities.

TABLE A - 2

NUMBER OF COMPUTER SCIENCE AND STATISTICS DEPARTMENTS
IN POPULATION AND SAMPLE

Control/Type	Population*	Sample
Computer Science		
Universities	105	51
Public Colleges	141	40
Private Colleges	<u>150</u>	<u>16</u>
	396	107
Statistics		
Universities	40	21
Public Colleges	<u>5</u>	<u>2</u>
	45	23

*Population sizes are estimated from the sample.

Less than 10 Mathematical Sciences Departments other than Mathematics, Statistics and Computer Science were found in the sampled schools.

All projected enrollments in Mathematics courses and other information in this report are based on the information supplied by the Mathematical Sciences Departments mentioned earlier in this section. For example, no attempt was made to determine enrollments in Mathematics, Statistics or Computer Science courses that were taught in non-Mathematical or Computer Sciences Departments in four-year colleges or universities.

Estimation Procedures

Course enrollments and other information in this report are estimated national figures for all institutions in the frame described earlier in this Appendix for Fall 1985. The projections were made using standard

procedures for stratified samples. For example, if stratum i has N_i schools in it, n_i schools respond with enrollments for course A and E_i is the total enrollment in Course A reported by these n_i schools, then the estimated total enrollment in Course A in Stratum i is given by:

$$\frac{N_i}{n_i} \cdot E_i$$

Required totals are then computed by adding estimates for appropriate strata.

The procedure used to handle separate Mathematical Sciences Departments at the same institution varied with the question. For course enrollments, data from all departments at each school were combined before projections were made. On the other hand, most information on faculty members was kept separate for the departments at each school.

Accuracy of Estimates

The response rates are given in Table A-3. They are down slightly from the 1980-81 study which had the highest response rates of any in this series of studies dating back to 1965-66.

TABLE A - 3

RESPONSE RATES IN DEPARTMENTS OF MATHEMATICS, STATISTICS,
AND COMPUTER SCIENCE

	Pop.*	Sample	Respondents	Response Rate
1. Public Universities				
Mathematics	95	45	38	83%
Statistics	34	19	17	89%
Computer Science	78	39	24	62%
2. Private Universities				
Mathematics	62	26	18	69%
Statistics	6	2	2	100%
Computer Science	27	12	8	67%
3. Public Four-Year Colleges				
Mathematics	427	105	81	77%
Statistics	5	2	2	100%
Computer Science	141	40	24	60%
4. Private Four-Year Colleges				
Mathematics	839	80	57	71%
Computer Science	150	16	8	50%
5. Two-Year Colleges	1040	172	110	64%

SUMMARY BY DEPARTMENT

Mathematics	1423	257	194	75%
Statistics	45	23	21	91%
Computer Science	<u>396</u>	<u>107</u>	<u>64</u>	<u>60%</u>
	1864	387	279	72%

*Figures for Statistics and Computer Science Departments were estimated from the sample.

Followup phone calls were made to all departments not responding by a certain date as was done in earlier studies. Later when the statistical

analysis was carried out, selected projections were made using only the first 60% of the questionnaires to be returned. These results agreed very well with the results for the entire data set.

The population frame (discussed earlier) had Fall 1982 enrollments for all schools. These enrollment figures for the responding schools were used to project total enrollments for all schools in the population. Actual enrollments were found by adding enrollments for all schools. Table A-4 contains a comparison of these results.

TABLE A - 4

COMPARISON OF ACTUAL AND ESTIMATED ENROLLMENTS

	Estimated Enrollment	Actual Enrollment	Error
Universities	2,866,665	2,903,490	-1.27%
Public Four-Year Colleges	3,026,499	2,978,696	+1.60%
Private Four-Year Colleges	1,515,073	1,582,379	-4.25%
Two-Year Colleges	4,810,920	4,642,187	+3.63%

A list of all responding departments is included as Appendix F.