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ABSTRACT

This survey of the Higher Education Panel (HEP) of the American Council on Education, conducted in July 1971, concerned first-year graduate enrollment and postdoctoral enrollment in science and engineering for the academic year 1970-71 and expected enrollments for 1971-72. Each institution was asked, first, to indicate new applications received through July 5, 1970 and actual first-year graduate and postdoctoral enrollment for that year and, then, to estimate enrollments for 1971, indicating the number of new applications received as of July 5, 1971. This information was requested for the following fields: physical sciences, basic medical sciences, other life sciences, psychology, other social sciences, engineering, and mathematical sciences. In addition, each institution was asked to specify changes in admissions policies since 1968 that may have affected the number or kinds of new science or engineering graduate and postdoctoral students in 1971. The survey was mailed to 86 institutions granting advanced degrees in science or engineering, and 78 of the returned questionnaires represent the basis for the present report. (Author/HS)

Higher Education Panel

Report

American Council on Education

Survey No. 1

August 19, 1971

Survey of First-Year Graduate and Postdoctoral Enrollment in Science and Engineering

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The first survey of the Higher Education Panel (HEP), conducted in July 1971, concerned first-year graduate enrollment and postdoctoral enrollment in science and engineering for the academic year 1970-71 and expected enrollments for 1971-72. Each institution was asked, first, to indicate new applications received through July 5, 1970 and actual first-year graduate and postdoctoral enrollment for that year and, then, to estimate enrollments for 1971, indicating the number of new applications received as of July 5, 1971. This information was requested for the following fields: physical sciences, basic medical sciences, other life sciences, psychology, other social sciences, engineering, and mathematical sciences. (See Figure 1 for a copy of the survey instrument and the definitions of the fields.) In addition, each institution was asked to specify changes in admissions policies or other institutional policies since 1968 that may have affected the number or kinds of new science or engineering graduate and postdoctoral students enrolling in 1971.

During the first week of July, the survey was mailed to 86 institutions granting advanced degrees in science or engineering. (These institutions included independent medical schools granting advanced degrees.) From this

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This survey was conducted for the Federal government under a grant supported by the National Science Foundation, the National Institutes of Health, and the U.S. Office of Education.

total group we received replies from 82 (a return of 95 percent), four of which were not usable because of missing data. Consequently, this report is based on the returns from 78 institutions, or 90 percent of those originally surveyed.

Sampling

The sampling for first-year graduate and for postdoctoral enrollments are discussed separately since the populations are different.

With respect to the first group, the basic observation units were the first-year graduate enrollees in specified science and engineering fields (as given on the previous page). From the total U.S. population of institutions, 222 institutions (including independent medical schools) granting Ph.D.'s in these fields were identified. Our sample consisted of 86 institutions (two of which were independent medical schools) or a 36.9 percent sample of the population of Ph.D.-granting institutions. The stratification of the population and the sample by five cells (public universities, private universities, public four-year colleges, private four-year colleges, and independent medical schools) is shown below:

Cell	Definition	Population	Final Sample	Percent of Population in Sample
I	Public universities	104	33	31.7
II	Private universities	57	24	42.1
III	Public four-year colleges	24	5	20.8
IV	Private four-year colleges	27	14	51.8
V	Independent medical schools	10	2	20.0
	Totals	222	78	35.1

As can be seen from the figures above, the final sample of the population was 35.1 percent (those returned and usable survey questionnaires) for the doctoral portion of the survey.

For the sampling of the postdoctorates we identified 171 institutions in the United States that have postdoctoral programs in science or engineering. Our sample included 64 institutions (37.4 percent of the population), three of which did not respond to our survey, and six which reported unusable data. Therefore, our final sample consisted of 55 institutions (32.2 percent of the population). The stratification of the

population and the sample by the five cell breakdown is shown below:

Cell	Definition	Population	Final Sample	Percent of Population in Sample
I	Public universities	86	25	29.1
II	Private universities	46	20	43.5
III	Public four-year colleges	7	1	14.3
IV	Private four-year colleges	22	7	31.8
V	Independent medical schools	10	2	20.0
	Totals	171	55	32.2

Weighting

The weighting of the data was different for graduate students and post-doctorates in the survey. In both cases, however, data from a given institution were weighted using a set of weights determined by the cell membership of that institution in the sampling design. For the graduate portion, total counts of each field group were weighted by the ratio of graduate enrollments in the field group for the population institutions in the relevant cell to those enrollments for the sample institutions in that cell. This was done separately for each field group using total enrollments given for 1969 by the USOE for weighting the applications data and total enrollment counts for 1970 and 1971. Part-time and full-time enrollments for 1969 were used as the basis for weighting actual and expected part-time and full-time counts for 1970 and 1971, respectively.

Although actual unweighted data counts for the various fields, applications, and reported enrollments are all mutually consistent, this is not the case with the weighted population estimates. The weighted data would be so consistent if a single weighting factor for each stratification cell had been used. However, different weights for each field and type of data (each subject to its own degree of error) were used. Moreover, marginal

totals were independently weighted. The choice of more elaborate weighting procedures sacrifices perfect consistency in the weighted counts (actually they are very nearly consistent) for a more relevant weight for each data item.

Data coded from responses to the open-ended question (#1) pertaining to graduate programs were weighted by the ratio of the number of population institutions in each cell to the number of sample institutions in that cell.

The postdoctoral section of the survey was weighted in the following manner. The reported total counts for 1970 and 1971 were weighted on the basis of postdoctoral enrollments reported by the National Academy of Sciences (See The Invisible University, Appendix B-2). Cell weights were computed by the ratio of those enrollments in each field group for the population institutions to those of the sample institutions.

The open-ended question (#2) pertaining to postdoctoral programs was weighted by the same procedure, based on the postdoctoral institutional sampling, as that used for the first question pertaining to doctoral programs.

Because the entire sampling and weighting procedures for the postdoctoral data are based on older and less technically adequate data, extreme caution is advised when basing any operational decisions on the results.

Tables 1 - 9 contain the data by field of the first-year graduate and postdoctoral enrollments (public, private, and total) and percent change between the academic years 1970 and 1971.

Table 10 reports the institutional responses to the open-ended question concerning institutional policy or admissions changes made since 1968. Further tabulations of the graduate data concerning administrative or policy changes indicates that those fields that have increased their program

size or scope are most often the physical sciences and engineering. The reason most often given for these increases is a larger demand in the job market.

Reduction of program size or scope, increased tuition, lowering of financial aid, restrictive admissions, suspended applications to Ph.D. program, and "other" occur most often graduate school-wide and not within any specific field. The reason most often given is to slow the rate of growth of the institution and in recognition of the current supply and demand situation in the job market. The primary exception is in the medical sciences, where fewer students are being enrolled because of the termination of NIH-supported Training Grants which provided stipend support. One institution is meeting its financial crisis by raising standards considerably for foreign students and eliminating financial assistance for new foreign students.

The two changes that occur together most often are the increase in tuition costs and the more restrictive admissions policies (including, in some cases, quotas on graduate enrollment). These changes most often occur because of the generally poor financial conditions of the institutions and to meet changes in outside support to graduate students.

Changes in institutional policies made during 1970 that would affect postdoctoral enrollment were few. Table 11 reports the only information gained from this question.

Table 1

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment
in Science and Engineering

All Institutions
(Weighted Population Estimates)

Field	First-Year Graduate Students							
	1970				1971			
	New Applications Through July 5	Actual 1st Year Enrollment (Fall)			New Applications Through July 5	Expected 1st Year Enrollment (Fall)		
	Total	Total	Full Time	Part Time	Total	Total	Full Time	Part Time
Physical Sciences	36,313	12,768	9,531	3,086	34,7 '5	13,548	10,148	3,273
Basic Medical Sciences	17,827	5,278	4,041	1,153	20,852	5,250	3,997	1,126
Other Life Sciences	23,531	10,901	7,273	3,535	22,993	11,343	7,567	3,689
Psychology	48,946	7,588	5,861	1,685	55,902	8,298	6,838	1,661
Other Social Sciences	62,420	18,354	12,362	5,972	62,103	19,364	13,340	5,828
Engineering	56,151	22,434	13,624	9,179	49,704	21,818	13,667	8,439
Mathematical Sciences	28,075	11,453	6,737	4,780	27,829	11,773	6,856	4,994
Totals	273,263	88,776	59,429	29,390	274,178	91,394	62,413	29,010

Table 2

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment
in Science and Engineering

Public Institutions
(Weighted Population Estimates)

Field	First-Year Graduate Students							
	1970				1971			
	New Applications Through July 5	Actual 1st Year Enrollment (Fall)			New Applications Through July 5	Expected 1st Year Enrollment (Fall)		
	Total	Total	Full Time	Part Time	Total	Total	Full Time	Part Time
Physical Sciences	23,516	9,748	7,174	2,324	22,653	10,671	7,878	2,564
Basic Medical Sciences	8,612	3,185	2,366	808	9,744	3,372	2,458	897
Other Life Sciences	17,200	9,290	6,230	2,959	17,008	9,770	6,535	3,141
Psychology	33,407	6,020	4,586	1,430	40,262	6,688	5,471	1,488
Other Social Sciences	32,273	12,004	8,349	3,607	32,575	12,712	8,946	3,695
Engineering	32,080	14,715	8,591	6,103	28,177	14,900	9,261	5,603
Mathematical Sciences	17,444	7,654	4,667	3,111	17,391	8,330	5,131	3,320
Totals	164,532	62,616	41,963	20,342	167,810	66,443	45,680	20,708

Table 3

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment
in Science and Engineering

Private Institutions
(Weighted Population Estimates)

Field	First-Year Graduate Students							
	1970				1971			
	New Applications Through July 5	Actual 1st Year Enrollment (Fall)			New Applications Through July 5	Expected 1st Year Enrollment (Fall)		
	Total	Total	Full Time	Part Time	Total	Total	Full Time	Part Time
Physical Sciences	12,797	3,019	2,357	762	12,142	2,877	2,270	708
Basic Medical Sciences	8,875	1,723	1,385	256	10,783	1,471	1,225	121
Other Life Sciences	6,331	1,611	1,044	576	5,985	1,573	1,032	548
Psychology	15,539	1,568	1,275	255	15,640	1,610	1,367	173
Other Social Sciences	30,147	6,350	4,013	2,365	29,528	6,652	4,395	2,132
Engineering	24,070	7,718	5,033	3,075	21,527	6,918	4,405	2,836
Mathematical Sciences	10,631	3,799	2,070	1,669	10,438	3,443	1,726	1,674
Totals	108,390	25,788	17,177	8,958	106,043	24,544	16,420	8,192

Table 4

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment
in Science and Engineering

Independent Medical Schools
(Weighted Population Estimates)

Field	First-Year Graduate Students							
	1970				1971			
	New Applications Through July 5	Actual 1st Year Enrollment (Fall)			New Applications Through July 5	Expected 1st Year Enrollment (Fall)		
	Total	Total	Full Time	Part Time	Total	Total	Full Time	Part Time
Physical Sciences								
Basic Medical Sciences	340	369	290	90	326	407	314	108
Other Life Sciences								
Psychology								
Other Social Sciences								
Engineering								
Mathematical Sciences								
Totals	340	369	290	90	326	407	314	108

Table 5

American Council on Education
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Postdoctoral Enrollment in Science and Engineering

(Weighted Population Estimates)*

	Actual Enrollment Fall/1970			Expected Enrollment Fall/1971			Percent Change 1970-1971		
	Public	Private	Total	Public	Private	Total	Public	Private	Total
Physical Sciences	1348	1505	2853	1310	1519	2829	-2.8	0.9	0.8
Basic Medical Sciences	792	1562	2354	815	1536	2351	2.9	-1.7	-0.1
Other Life Sciences	658	607	1265	651	673	1324	-1.1	10.9	4.7
Psychology	84	151	235	103	135	237	22.6	-10.6	0.8
Other Social Sciences	181	121	302	186	100	286	2.8	-17.4	-5.3
Engineering	411	308	719	400	327	727	-2.7	6.2	1.1
Mathematical Sciences	37	87	124	24	48	72	-35.1	-44.8	-41.9
Total	3511	4341	7852	3489	4338	7827	-0.6	-0.1	-0.3

*Excluding independent medical schools

Table 6

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment in Science and Engineering
Percent Change Between 1970 and 1971

All Institutions

Field	New Applications Through July 5	Enrollment Total	Enrollment Full-Time	Enrollment Part-Time
Physical Sciences	-4.2	6.1	6.5	6.1
Basic Medical Sciences	17.0	-.5	-1.1	-2.3
Other Life Sciences	-2.3	4.1	4.0	4.4
Psychology	14.2	9.4	16.7	-1.4
Other Social Sciences	-.5	5.5	7.9	-2.4
Engineering	-11.5	-2.8	.3	-8.1
Mathematical Sciences	- .9	2.8	1.8	4.5
Totals	.3	2.9	5.0	-1.3

Table 7

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment in Science and Engineering
Percent Change Between 1970 and 1971

Public Institutions

Field	New Applications Through July 5	Enrollment Total	Enrollment Full-Time	Enrollment Part-Time
Physical Sciences	-3.7	9.5	9.8	10.3
Basic Medical Sciences	13.1	5.9	3.9	11.0
Other Life Sciences	-1.1	5.2	4.9	6.2
Psychology	20.5	11.1	19.3	4.1
Other Social Sciences	.9	5.9	7.2	2.4
Engineering	-12.2	1.3	7.8	-8.2
Mathematical Sciences	-.3	8.8	9.9	6.7
Totals	2.0	6.1	8.9	1.8

Table 8

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment in Science and Engineering
Percent Change Between 1970 and 1971

Private Institutions

Field	New Applications Through July 5	Enrollment Total	Enrollment Full-Time	Enrollment Part-Time
Physical Sciences	-5.1	-4.7	-3.7	-7.1
Basic Medical Sciences	21.5	-14.6	-11.6	-52.7
Other Life Sciences	-5.5	-2.4	-1.2	-4.9
Psychology	0.7	2.7	7.2	-32.2
Other Social Sciences	-2.1	4.8	6.0	-9.9
Engineering	-10.6	-10.4	-12.5	-7.7
Mathematical Sciences	-1.8	-3.4	-16.6	0.3
Totals	-2.2	-4.8	-4.3	-8.5

Table 9

American Council on Education
Higher Education Panel
Survey No. 1

First-Year Graduate Enrollment in Science and Engineering
Percent Change Between 1970 and 1971

Independent Medical Schools

Field	New Applications Through July 5	Enrollment Total	Enrollment Full-Time	Enrollment Part-Time
Physical Sciences				
Basic Medical Sciences	-4.2	10.4	8.1	20.0
Other Life Sciences				
Psychology				
Other Social Sciences				
Engineering				
Mathematical Sciences				
Totals	-4.2	10.4	8.1	20.0

Table 10

Institutional Policy or Admissions Changes Made Since 1968
Affecting the Number or Kind of New Science or Engineering Graduate Students
Enrolling in 1971
(Weighted Population Estimates)

	Public (128)	Private (84)	Total (212)*
Changes Made	(N=48)	(N=27)	(N=74)
Have lowered or stopped financial aid to graduate students	6	7	13
Have increased tuition	19	0	19
Have established restrictive admissions policies	13	2	15
Have abolished or are phasing out Engineering	3	2	5
Have suspended applications to the Ph.D. program	0	2	2
Have increased program size and/or scope	21	9	30
Have reduced program size and/or scope	0	2	2
Other	5	7	12
Why Changes Were Made			
General financial conditions make it necessary	16	6	22
Conducting a re-evaluation of the program	3	4	7
There is less outside financial support for graduate students	3	2	5
There is an increase in the job market demand in the field	15	12	27
There is a decrease in the job market demand in the field	6	2	8
Actual Effect of the Changes			
No effect	3	2	5
An increase in enrollment in graduate school	11	5	16
A decrease in enrollment in graduate school	19	11	30
Anticipated Effect of the Changes			
No effect	3	5	8
Increase in enrollment	11	7	18
Decrease in enrollment	25	13	38

* Excluding independent medical schools.

Table 11

Institutional Policy Changes Made During 1970-71 Affecting the Number or Kind of New Postdoctorates in Science or Engineering Enrolling in 1971
(Weighted Population Estimates)

	Public (93)	Private (68)	Total (161)*
Changes Made	(N=6)	(N=0)	(N=6)
There have been new programs developed	3	0	3
The tuition has been increased	3	0	3
Why Changes Were Made			
For research purposes	3	0	3
To limit enrollment for financial reasons	3	0	3

* Excluding independent medical schools.

Figure 1: Survey Questionnaire

American Council on Education
Higher Education Panel
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First-Year Graduate Enrollment and Postdoctorates
in Science and Engineering

Fields*	First-Year Graduate Students							Postdoctorates*	
	1970				1971			Fall 1970	Fall 1971
	New Applications Through July 5	Actual 1st Year Enrollment*(Fall)			New Applications Through July 5	Expected 1st Year Enrollment*(Fall)		Actual No.	Expected No.
	Total	Total	Full Time	Part Time	Total	Total	Full Time	Part Time	Total	Total
Physical Sciences										
Basic Medical Sciences										
Other Life Sciences										
Psychology										
Other Social Sciences										
Engineering										
Mathematical Sciences										

*See definitions on reverse side

1. Were any institutional policy or admissions changes made since 1968 that would affect the number or kind of new science or engineering graduate students enrolling in 1971? If so, what were they and why were they made? What are the actual and anticipated effects on enrollment? (Use additional sheets as necessary)

2. Were any institutional policy changes made during the academic year 1970-71 that would affect the number or kind of new postdoctorates in science or engineering to be accepted in 1971? If so, what were they and why were they made? (Use additional sheets as necessary)

Definitions

First-year enrollment: Students enrolled for a master's or higher academic degree (e.g., Ph.D., Ed.D., etc.) who have completed less than two semesters or three quarters of full-time graduate study or the equivalent in part-time study; a full-time student's academic load in terms of course work or other activity (e.g., research, teaching) is at least 75 percent of that normally required. Do not include students enrolled for first professional degrees (e.g., M.D., D.D.S., LL.B., etc.) unless they are also enrolled for a master's or higher degree.

Postdoctorates: Include in this category only individuals (1) who received a Ph.D., D.Sc., M.D., or equivalent degree less than 5 years ago and (2) who have appointments of a temporary nature at the postdoctoral level which are intended to offer further education and experience in research, usually, though not necessarily, under the supervision of a senior mentor. Although appointments to Instructor and Assistant Professor are temporary, they are excluded because they are understood to be part of the regular series of academic appointments and normally lead to a tenure position. Candidates studying for another doctorate which does not involve research as a primary activity are also excluded.

Physical sciences: Includes chemistry, earth science, physics, geology, meteorology, astronomy, metallurgy, geophysics, oceanography, pharmaceutical chemistry

Basic medical sciences: Includes anatomy, biochemistry, biophysics, microbiology, pathology, pharmacology, and physiology.

Other life sciences: Includes agriculture, forestry, biology, botany, zoology, ecology, embryology, entomology, genetics, nutrition, plant pathology, plant physiology.

Psychology: Includes all psychology.

Other social sciences: Includes anthropology, economics, political science, sociology, government, international relations. (This category should not include history, education, social work, public administration, agricultural economics, or other applied fields.)

Engineering: Includes aeronautical, architectural, biomedical, ceramic, chemical, civil, electrical, engineering sciences, environmental health engineering, geological, industrial, mechanical, mining, nuclear, petroleum, and all other forms of engineering.

Mathematical sciences: Includes mathematics, statistics, computer sciences, data processing, systems analysis, and all related fields.

Data Sources