DOCUMENT RESUME

ED 116 574 HE 007 006

AUTHOR Fribush, Stuart L.; Larson, Thomas A.
TITLE Medical School Characteristics Associated with Faculty Participation in Federal Programs.
INSTITUTION Association of American Medical Colleges, Washington, D. C.; Health Resources Administration (DHEW/PHS), Bethesda, Md. Bureau of Health Resources Development.
REPORT NO DHEW-RHA-75-74
PUB DATE Apr 75
NOTE 51p.; For related documents, see HE 007 019-022

EDRS PRICE MF-$0.76 HC-$3.32 Plus Postage
DESCRIPTORS Clinical Experience; Educational Objectives; *Federal Programs; Graduate Study; *Higher Education; *Medical Education; *Medical Schools; Models; Statistical Analysis; Teacher Attitudes; *Teacher Participation

ABSTRACT

This document attempts to quantify the objectives of various Federal programs of support to medical schools and to examine the extent to which these objectives have been met. It utilizes a multivariate regression model to investigate variations among the characteristics of 50 medical schools in 1972 associated with high and low faculty participation in federal programs. It presents four factors as possible participation rates in National Institutes of Health (NIH) training grants and in other federal programs: (1) propensity of the medical school to produce graduates later employed in academic medicine; (2) experience of the faculty with respect to previous participation in federal programs; (3) emphasis on graduate training in the basic sciences; and (4) clinical orientation of the medical school. Utilizing nine variables to describe the four predictors, a model was devised that predicts faculty participation rates in the NIH training grant programs among the medical schools. Using the same variables, a similar model was developed to predict participation in other federal programs, primarily NIH research programs. (Author/KE)

MEDICAL SCHOOL CHARACTERISTICS ASSOCIATED WITH FACULTY PARTICIPATION IN FEDERAL PROGRAMS

Prepared by the Association of
American Medical Colleges (AAMC)
under Contract number NIH 72-4401

Health Manpower References

2

U.S. DEPARTMENT OF HEALTH EDUCATION AND WELFARE
Public Health Service
Health Resources Administration
Bureau of Health Manpower
April 1975
DHEW Publication No. (HRA) 75-74

Effective May 5, 1975, a reorganization of the Health Resources Administration divided the former Bureau of Health Resources Development into two new components – the Bureau of Health Manpower and the Bureau of Health Planning and Resources Development. The material described in this publication was prepared in BHRD, and now falls within the purview of the new Bureau of Health Manpower.

Medical School Characteristics Associated With Faculty Participation in Federal Programs

Stuart L. Fribush
Thomas A. Larson

The work upon which this publication is based was supported in part by the Bureau of Health Resources Development, Department of Health, Education and Welfare pursuant to contract number NO1-MI-24401. However any conclusions and/or recommendations expressed herein do not necessarily represent the views of the supporting agency.

Mr. Fribush is Staff Associate and Mr. Larson is Director, Faculty Profiles. Both are in the Division of Operational Studies, Department of Planning and Policy Development at the Association of American Medical Colleges, Washington, D.C.

FOREWORD

A major mission of the Bureau of Health Resources Development (BHRD)* is assuring the development of an adequate supply of well-qualified health manpower for the Nation. To help carry out this mission, the Bureau provides financial support for the institutions training health manpower. This support has been of three types: Assistance for the construction and renovation of facilities; student assistance through loans, scholarships, traineeships, and fellowships; and assistance for the operation, expansion, and improvement of the schools (including support of faculty).

In recent years, as the cost of medical education burgeoned and Federal contributions rose, there has been a growing concern over the impact of Federal funding on the institutions training health manpower, especially upon the supply, qualifications, and retention of faculty – its role models, recognition of its importance, etc. Under terms of a contract (No. MI-24401) with BHRD, the Association of American Medical Colleges (AAMC) agreed to carry out a series of studies of medical school faculty. These studies were in large part based on data in a Faculty Roster System maintained by the Association for all 114 medical schools in the United States.

A medical school faculty profile project was initiated in 1966 by the AAMC in cooperation with the National Institutes of Health. In the early years of the project's operation, faculty profile data were obtained by annual questionnaires sent to all medical schools. Under the contract with BHRD, a computerized Faculty Roster System was developed which provides for the immediate input of information by each medical school upon the accession of each new faculty member, each transfer or other departure, as well as each change in status of a faculty member. The Faculty Roster System of the AAMC contains information on the demographic, educational, and professional characteristics of almost 50,000 past and present salaried faculty members.

* The Bureau of Health Resources Development (BHRD) became the Bureau of Health Manpower (BHM) on May 5, 1975.

This report "Medical School Characteristics Associated With Faculty Participation in Federal Programs", is one of five reports covering various aspects of medical school faculty which has been prepared by the AAMC under its contract with BHRD. This study was undertaken to quantify the objectives of various Federal programs of support to medical schools and to examine the extent to which these objectives have been met. The study utilizes a multivariate regression model to investigate variations among the characteristics of 50 medical schools in 1972 associated with high and low faculty participation in Federal programs.

The study presents four factors as possible predictors of the variations in faculty participation rates in National Institutes of Health (NIH) training grants and in other Federal programs: 1) propensity of the medical school to produce graduates later employed in academic medicine: 2) experience of the faculty with respect to previous participation in Federal programs: 3) emphasis on graduate training in the basic sciences; and 4) clinical orientation of the medical school. These predictors were presumed to be related to the NIH objectives of assurance of quality and quantity of scientists and of teachers of physicians.

Utilizing nine variables to describe the four predictors, a model was devised which predicts faculty participation rates in the NIH training grant programs among the medical schools. Using the same variables, a similar model was developed to predict participation in other Federal programs, primarily NIH research programs.

This report was prepared by Mr. Stuart L. Fribush, Staff Associate, and Mr. Thomas A. Larson, Director, Faculty Profiles in the Division of Operational Studies, Department of Planning and Policy Development at the Association of American Medical Colleges. The report is being published by the Resource Analysis Staff, Howard V. Stambler, Chief.

The five reports in the series are:

- Mobility Characteristics of U.S. Medical School Faculty in 1971.
- A Preliminary Analysis of Differential Characteristics Between HIgh and Low Mobile Medical School Faculty.
- Institutional Variables Related to High Faculty Attrition.
- Medical School Characteristics Associated With Faculty Participation in Federal Programs.
- Postdoctorals vs. Nonpostdoctorals: Career Performance Differentials Within Academic Medicine.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

The Association of American Medical Colleges and the National Institutes of Health established the Medical School Faculty Profile project in 1966. Since that time, this project has grown substantially, and AAMC, in cooperation with its constituent medical schools, now has available a comprehensive information system on the characteristics of salaried medical school faculty.

The Faculty Profile Project is used increasingly as the data base for a number of analytical efforts concerned with medical academia. Three general analytical thrusts are currently being pursued: (1) sex and ethnic hiring trends; (2) faculty mobility and attrition patterns; (3) faculty participation in Federal programs.

The present study falls under the third category. In general, this document is the result of an effort to determine characteristics of institutions which best predict variation in rates of faculty participation in Federal programs across medical schools. Federal programs were divided into two groups; NIH training grants and other Federal programs (predominantly NIH research programs). Institutional characteristics were then chosen which were presumed to relate to the Federal program objectives. These relationships were examined through multivariate regression techniques. In a very broad sense then, this study attempts to measure the objectives of the various Federal programs, and particularly the NIH training programs, and then examine the extent to which these Federal program objectives have been met.

CHAPTER 2

NATIONAL SUMMARY OF FACULTY PARTICIPATION IN FEDERAL PROGRAMS, 1971-72

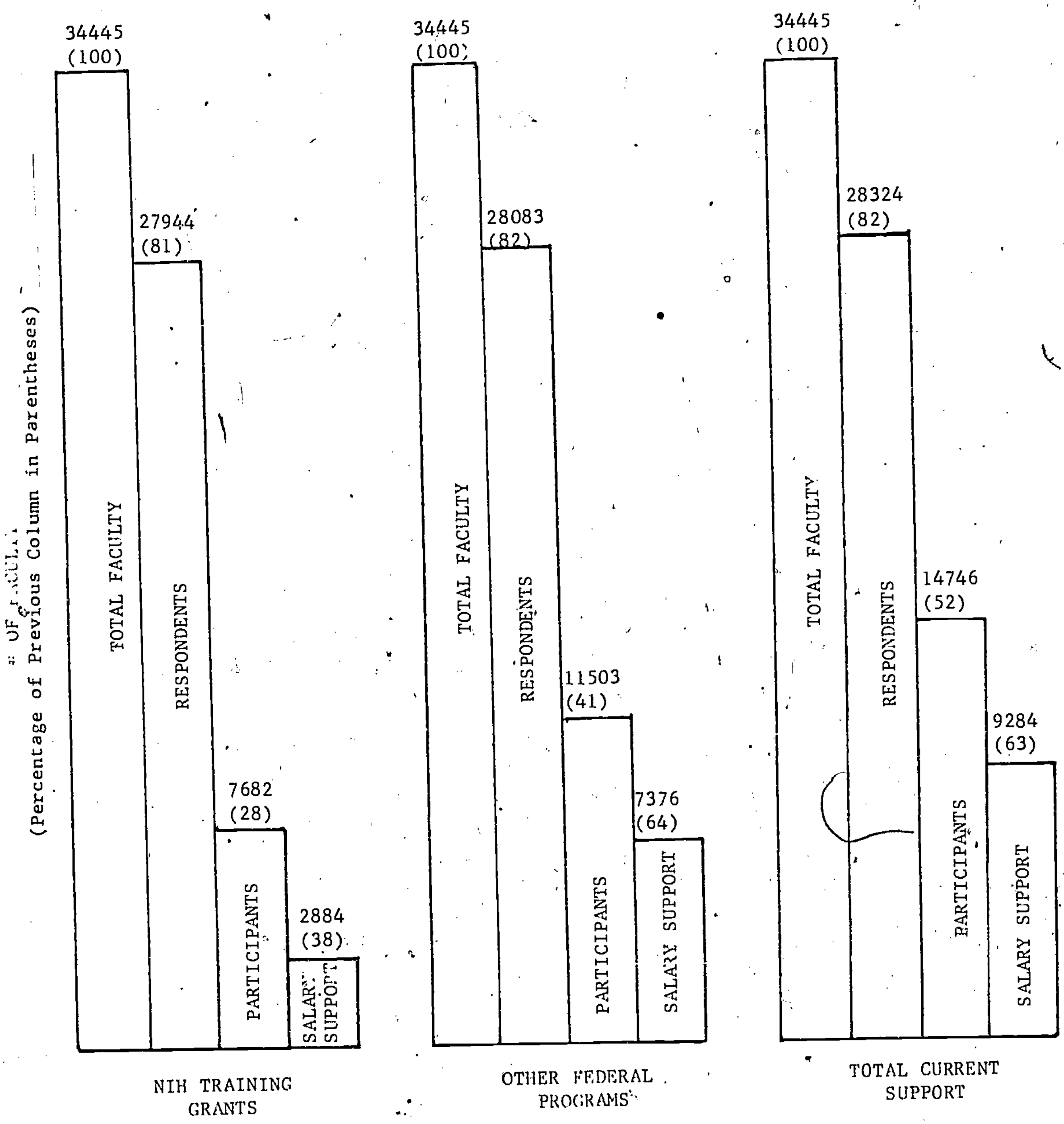
The Data

The Association of American Medical Colleges, through its Faculty Profile Project, collects data on medical school faculty participation in Federal programs. These programs include research and training programs sponsored by various Federal agencies, primarily the National Institutes of Health (NIH). Information concerning faculty participation was gathered from two separate questions on the 1971-72 Faculty Profile Questionnaire (See Appendix A). One question was restricted solely to faculty participation in NIH training grants, while the other addressed itself to faculty participation in all other Federally sponsored programs. These "other Federal programs" include programs of the NIH (other than training grants), Health Services and Mental Health Administration[1] (HSMHA), other agencies within Health, Education and Welfare (HEW), the Veterans Administration and various other Federal agencies. For the most part, these "other Federal programs" are research programs rather than training programs.

Tabulations for the NIH training grant question indicate that of the 27,944 salaried medical school faculty responding, 7,682 (28 percent) were participating in NIH training grants. Of these, 2,884, or 38 percent of the participants, were receiving at least a portion of their salary from these grants. Similarly, the figures for "other Federal programs" were 28,083 faculty responding, 11,503 (41 percent) participating, and 7,376 (64 percent of the participants) receiving salary support. When the data in response to the two questions are aggregated and the overlap is subtracted, the results indicate that of the 28,324 responding to either question, 14,746 (52 percent) were participating in some Federal program in (fiscal year) 1972. Of these, 9,284, or 63 percent of the participants, were receiving some salary support. Therefore, it appears as though roughly one-third of the responding salaried medical school faculty were receiving salary support from Federal sources in FY 1972. Summarized in Figure 1, these data show that most of the participants were involved in the "other Federal programs" and additionally most of the salary support was provided by these programs.

FIGURE 1

NATIONAL SUMMARY OF FACULTY PARTICIPATION IN FEDERAL PROGRAMS FY 1972



Limitations

Although the faculty profile system is very comprehensive, data, particularly with regard to faculty participation in Federal programs, may be subject to limitations. Some Federal programs, NIH training grants for example, are administered at the institutional or departmental level. Therefore, it is possible that the questionnaire respondent, whether a faculty member or a member of the administrative staff, would not be aware of the source of salary let alone whether the faculty member is participating in a Federally sponsored program. It is likely, then, that the figures given in this section and particularly the figures on NIH training grant participation, understate the true values to some extent.

CHAPTER 3

FACULTY PARTICIPATION IN NIH TRAINING GRANTS

Faculty Participation in NIH Training Grants By Institution

The purpose of this chapter is to identify those institutional characteristics which best predict the range in faculty participation rates in NIH training grants among medical schools.

Figure 2 depicts the distribution of faculty participation rates in NIH training grants for 100 medical schools. Participation rates were defined for each school as faculty participating in NIH training grants divided by faculty responding to the NIH training grant question on the faculty profile questionnaire (see Appendix A). Only the schools that reported more than 10 salaried faculty in 1972 and in which at least 50 percent of the faculty responded to the question concerning participation in NIH training grants were considered. As can be seen, participation rates across institutions very from a minimum of 0 percent to a maximum greater than 60 percent. This spread is quite substantial and deserves further analysis.

Research Hypotheses

According to an NIH statement regarding its training programs, NIH support of graduate education and postdoctoral training enables the agency to:

1. Maintain a superior national program of biomedical research;
2. Increase the production of well-trained health manpower for service.[2]

In order to meet these objectives, NIH training grants are generally concentrated in "institutions generally regarded as excellent".[3] This statement, however, may never have been quantified and tested. Described below are institutional factors which appear to have direct bearing on the objectives of such training programs as defined by NIH. The term "factor" used in this report refers exclusively to an intuitive grouping of variables.

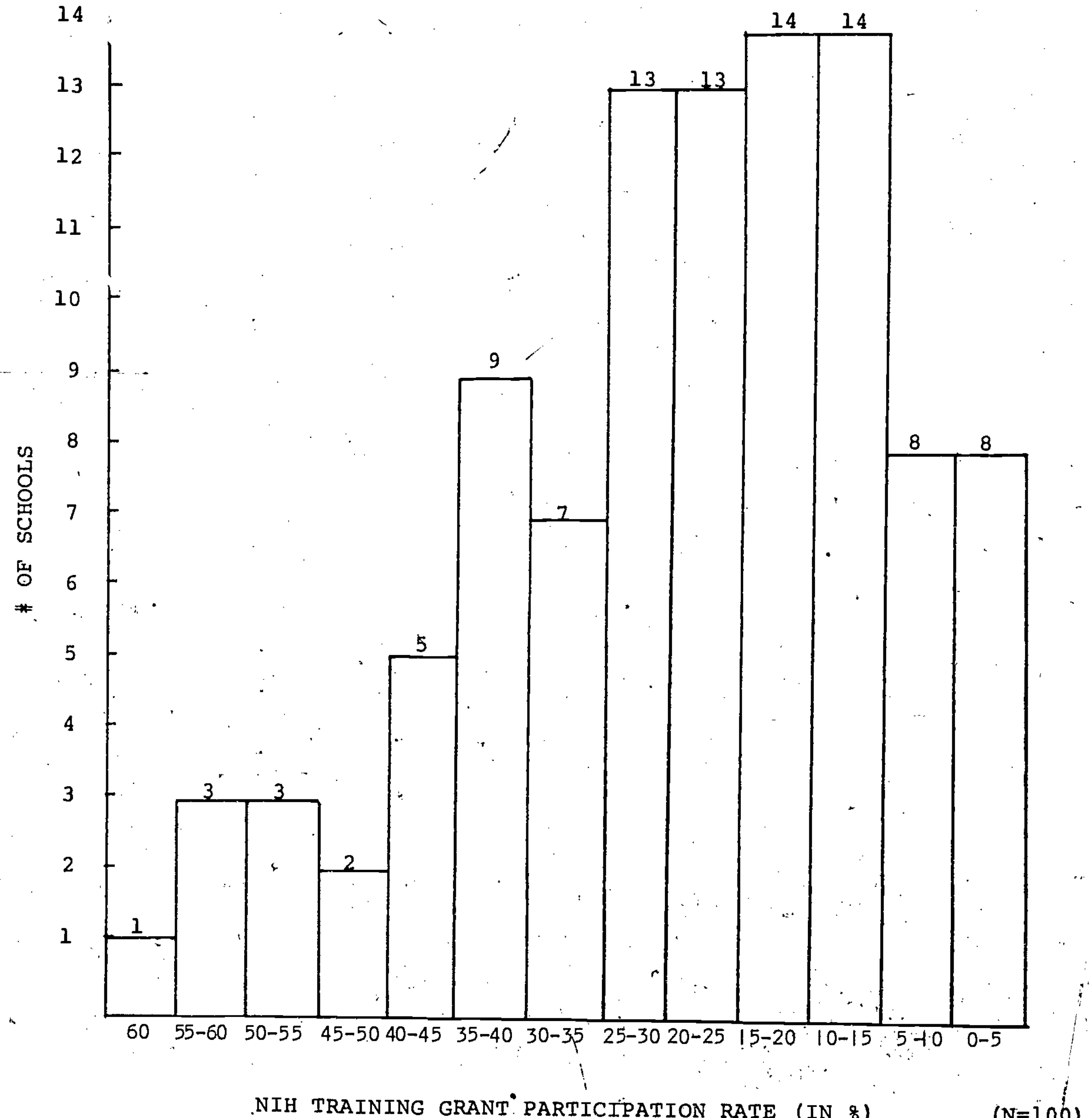
1. Propensity of the school to produce graduates later employed in academic medicine. This factor was measured in two ways:

   a. Number of graduates ever in academic medicine between 1967 and 1972 divided by the total number of living active graduates as of 1967;

   b. Number of graduates in academic medicine in 1972 at a school other than the school of graduation divided by the total number of living active graduates as of 1967.

FIGURE 2

DISTRIBUTION OF FACULTY PARTICIPATION RATES
IN NIH TRAINING GRANTS
FOR 100 MEDICAL SCHOOLS



This second measure was included because it was felt that the condition of employment at a school other than the school of graduation reflected the esteem of the graduating school as perceived by the employing school. It is expected that a positive relationship exists between this factor and participation in NIH training grants because schools doing more postgraduate training should be producing more academically oriented graduates.

2. Experience of the faculty with respect to previous participation in Federal programs.
   This factor was also measured through two variables:

   a. Proportion of 1972 salaried faculty with previous postdoctoral support;

   b. Proportion of 1972 salaried faculty with previous predoctoral support.

This factor is also expected to correlate positively with faculty participation in NIH training grants because faculty who themselves were previous trainees probably are more aware of, more interested in, and better qualified for training roles than faculty who were not previous trainees.

3. Emphasis on graduate training in the basic sciences.
   Three variables were used to measure this factor:

   a. Number of graduate students in the basic sciences;

   b. Ratio of graduate students in the basic sciences to faculty with basic science appointments;

   c. Ratio of graduate students in the basic sciences to total students.

A positive correlation is expected to be found between faculty participation in NIH training programs and this factor because it is presumed that much of the postgraduate training is concentrated in basic science departments.

4. Clinical orientation of the medical school.
   Two variables were used to measure this factor:

   a. The proportion of 1972 salaried faculty holding the MD degree;

   b. The proportion of 1972 salaried faculty in the basic science departments (correlates negatively with clinical orientation).

The expectation is a negative correlation between faculty participation and the proportion of faculty holding the M.D. degree and a positive correlation between faculty participation and proportion of faculty in basic science departments. The variable "proportion of faculty in basic sciences" was included because inspection of faculty participation in Federal programs by department revealed that basic science departments generally have higher rates of faculty participation in Federal programs than clinical science departments. For a breakdown of faculty participation by departments, see Appendix B.

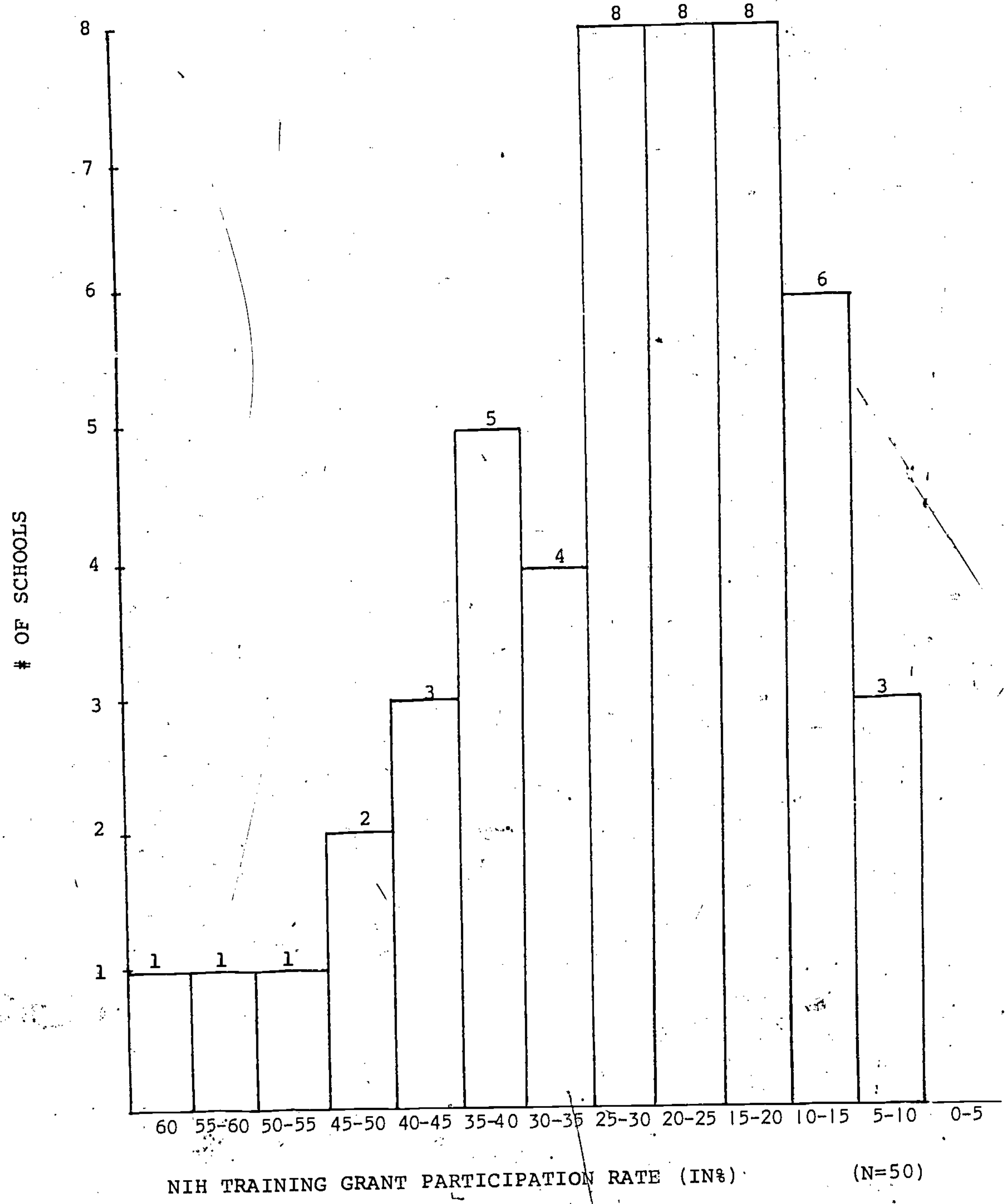
These four factors are presented as possible predictors of the variation in faculty participation rates in NIH training grants between schools. In order to test the relationship between these four factors, a multivariate regression model will be developed incorporating the nine variables describing the four factors as explanatory variables and the faculty participation rate in NIH training grants as the dependent variable. The expectation is that schools which are high in factors 1, 2, and 3, and low in factor 4, will be high in NIH training grants participation.

Data Sources

In order to test the model, it was necessary to draw data from several sources. Data on faculty participation in NIH training grants were selected from the Faculty Profile System (FPS). Also available from FPS were sufficient data to calculate the variables constituting factors 2 and 4 for each school. The data for factor 1 were selected partially from FPS and partially from an American Medical Association source.[4] Part of the data for factor 3 were derived from FPS and part from the Institutional Profile System (IPS), another data base maintained by the AAMC. Often, however, when integrating data from varied sources, missing data are likely to occur. Such was the case when information from the Institutional Profile System was integrated, IPS maintained data on only 92 schools for the information required while FPS maintained the necessary data on 113 schools. In addition, the utilization of the variable "total graduates as of 1967" necessarily led to the elimination of any medical school accepting its first class after 1964. Also, in order to increase confidence in the regression model, schools with less than a 90 percent response rate were eliminated from the analysis. These restrictions resulted in the elimination of 50 schools; only 50 remained in the analysis. In Figure 3, the distribution of faculty participation rates in NIH training grants for the 50 schools is shown. A comparison with Figure 2, a similar distribution for 100 schools, shows that the range of participation rates still varies a great deal. Furthermore, for 100 schools, the mean participation rate was 24 percent with a standard deviation of 14.6. For the

FIGURE 3

DISTRIBUTION OF FACULTY PARTICIPATION RATES
IN NIH TRAINING GRANTS
FOR 50 MEDICAL SCHOOLS



50 remaining schools, the mean participation rate was 27 percent with a standard deviation of 13.3. Clearly, there is still much variation in faculty participation rates to be explained. A list of the 50 schools remaining in the analysis appears in Appendix C.

Simple Correlations

Table 1 gives the matrix of correlation coefficients for the dependent variable and the nine explanatory variables. Variable definitions for this table appear in Table 2. Table 1 is partitioned into several smaller sub-tables according to the factors presented in the previous subsection. The simple correlations between the dependent variable "faculty participation in NIH training grants" (Y^1) and each explanatory variable are all significant at the .001 level with the exception of the last two (percent of faculty holding M.D. degree and percent of faculty in basic science departments). Furthermore, all the significant correlations are positive, as expected. Within each of the first 3 factors, the correlations between each variable in the factor with every other variable in the factor are all significant at the .001 level. However, this relationship does not hold for the clinical orientation factor. Here, the correlation between the two variables, "percent of faculty holding the M.D. degree and "percent of faculty in basic science departments", is not significantly different from zero. In a regression model incorporating all of these variables, it is expected that at least one variable each from factors 1, 2 and 3 would enter before any variables from factor 4.

The Regression

The use of stepwise-regression permitted all nine variables to be entered in the equation according to the contribution made to predicting the variation in faculty participation rates in NIH training grants.

Table 3 presents a summary of the regression run. Each of the four variables entered first represents different factors. After these first four variables were brought into the equation, the incremental variation in participation rates predicted by additional variables, as measured by the change in R, became negligible.

The fact that the variable X^2 (percent of total living active graduates as of 1967 in academic medicine in 1972 at a school other than the school of graduation) was entered first and predicted more than 40 percent of the variation in faculty participation rates in NIH training grants by itself was a significant finding. The implication is that there

TABLE 1

CORRELATION MATRIX FOR FACULTY PARTICIPATION

IN NIH TRAINING GRANTS AND NINE EXPLANATORY VARIABLES

			FACTOR 1		FACTOR 2		FACTOR 3			FACTOR 4	
		Y_1	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
	Y_1	1.00 s=.001	.54 s=.001	.64 s=.001	.48 s=.001	.63 s=.001	.58 s=.001	.46 s=.001	.61 s=.001	-.05 s=.354	-.14 s=.161
FACTOR 1	X_1	.54 s=.001	1.00 s=.001	.85 s=.001	.04 s=.392	.42 s=.001	.31 s=.014	.24 s=.046	.42 s=.001	.18 s=.106	-.25 s=.040
	X_2	.64 s=.001	.85 s=.001	1.00 s=.001	.27 s=.028	.58 s=.001	.39 s=.003	.35 s=.006	.53 s=.001	.07 s=.311	-.[illegible] s=.082
FACTOR 2	X_3	.48 s=.001	.04 s=.392	.27 s=.028	1.00 s=.001	.44 s=.001	.39 s=.003	.43 s=.001	.53 s=.001	-.27 s=.029	.30 s=.018
	X_4	.63 s=.001	.42 s=.001	.58 s=.001	.44 s=.001	1.00 s=.001	.36 s=.005	.30 s=.017	.44 s=.001	.18 s=.103	-.08 s=.302
FACTOR 3	X_5	.58 s=.001	.31 s=.014	.39 s=.003	.39 s=.003	.36 s=.005	1.00 s=.001	.85 s=.001	.77 s=.001	.10 s=.244	-.21 s=.071
	X_6	.46 s=.001	.24 s=.046	.35 s=.006	.43 s=.001	.30 s=.017	.85 s=.001	1.00 s=.001	.82 s=.001	-.02 s=.443	-.37 s=.004
	X_7	.61 s=.001	.42 s=.001	.53 s=.001	.53 s=.001	.44 s=.001	.77 s=.001	.82 s=.001	1.00 s=.001	-.08 s=.301	-.09 s=.271
FACTOR 4	X_8	-.05 s=.354	.18 s=.106	.07 s=.311	-.27 s=.029	.18 s=.103	.10 s=.244	-.02 s=.443	-.08 s=.301	1.00 s=.001	.02 s=.448
	X_9	-.14 s=.161	-.25 s=.040	-.20 s=.082	.30 s=.018	-.08 s=.302	-.21 s=.071	-.37 s=.004	-.09 s=.271	.02 s=.448	1.00 s=.001

NOTES:
N = 50 medical schools

s = significance level

TABLE 2

Variable Definitions for Regression Model

DEPENDENT VARIABLE

1) Y_1 - Faculty participation rate in NIH training grants (100* 1972 salaried faculty participating/1972 salaried faculty responding)

INDEPENDENT VARIABLES

2) X_1 - Percent of living active graduates as of 1967 who were ever in academic medicine between 1967 and 1972 (100* number of graduates in academic medicine between 1967/total number of graduates as of 1967)

3) X_2 - Percent of living active graduates as of 1967 who were in academic medicine in 1972 at a school other than school of graduation (100* number of graduates in academic medicine at non-graduating school/total number of graduates as of 1967)

4) X_3 - Percent of 1972 salaried faculty receiving pre-doctoral support in the past (100* number receiving pre-doctoral support/number responding to pre-doctoral support question)

5) X_4 - Percent of 1972 salaried faculty receiving post-doctoral support in the past (100* number receiving post-doctoral support/number responding to post-doctoral support question)

6) X_5 - Number of graduate students in the basic sciences in 1972

7) X_6 - 1972 ratio of graduate students in the basic sciences to basic science faculty (number of graduate students in the basic sciences/number of faculty in basic science departments)

8) X_7 - 1972 ratio of graduate students in the basic sciences to total students (number of graduate students in the basic sciences/total number of students)

9) X_8 - Percent of 1972 salaried faculty holding the MD degree (100* number of faculty with MD/total faculty)

10) X_9 - Percent of 1972 salaried faculty in basic science departments (excluding Pathology) (100* number of faculty holding primary appointment in basic science departments/total faculty)

TABLE 3

SUMMARY TABLE OF REGRESSION RESULTS FOR FACULTY

PARTICIPATION IN NIH TRAINING GRANTS

DEPENDENT VARIABLE... Y_1 – Percent of 1972 salaried faculty participating in NIH training grants

EXPLANATORY VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE
X_2	– Proportion of living active graduates as of 1967 in academic medicine in 1972 at other than graduating school	.64	.41	.41
X_5	– Graduate students in the basic sciences in 1972	.74	.54	.13
X_4	– Percent of 1972 salaried faculty with previous post-doctoral support	.78	.60	.06
X_8	– Percent of total faculty with MD in 1972	.80	.63	.03
X_7	– 1972 ratio of graduate students in the basic sciences to basic science faculty	.80	.64	.01
X_3	– Percent of 1972 salaried faculty with previous pre-doctoral support	.81	.65	.01
X_1	– Proportion of living active graduates as of 1967 ever having been in academic medicine between 1967 and 1972	.82	.66	.01
X_9	– Percent of 1972 salaried faculty in basic science departments	.82	.67	.01
X_6	– 1972 ratio of graduate students in the basic sciences to total students	.83	.68	.01

is a strong relationship between the level of faculty participation in NIH training grants and the production of academicians. Since medical school faculty members are generally involved in biomedical research as well as the training of M.D.'s, this relationship is consistent with the two NIH objectives cited previously; namely, to maintain a superior national program in biomedical research and to increase the production of well trained health manpower for service.

The second variable entered into the regression equation was the number of graduate students in the basic sciences. This variable contributes an additional 13 percent towards the prediction of the variation in participation rates. This contribution implies that emphasis on graduate training in the basic sciences is a significant factor in predicting the variation in faculty participation rates in addition to the propensity of the school to produce academic types. However, it should be pointed out that these two factors are not entirely independent, as evidenced by a .39 correlation coefficient significant at the .003 level between the first two explanatory variables entered in the regression (see Table 1). Also, it is possible that the variable "number of graduate students in the basic sciences" enters because it reflects institutional size, rather than graduate training in the basic sciences. This observation can be examined through refinements in the model, and will be discussed in the next section.

The third variable to be incorporated into the regression model is the proportion of faculty receiving postdoctoral support in the past. Faculty receiving such support are probably ex-trainees themselves and this experience should have a positive effect on their participation in current training roles. This variable contributed only an additional 6 percent to the variation predicted by the model, even though the simple correlation coefficient between this variable and the dependent variable is over 0.63. However, since this variable has a significant positive correlation with the first two explanatory variables entered in the regression, most of its contribution is made indirectly through these two variables.

The fourth variable to be incorporated into the model is the proportion of faculty holding the M.D. degree. The regression coefficient of this variable is negative, and furthermore, is significantly different from zero. This coefficient implies that in general, the larger the proportion of salaried M.D. faculty, the lower the faculty participation rate in NIH training grants. However, this variable only adds 6 percent to the explained variation in participation rates. Inspection of the simple correlation coefficients between this variable and the first three explanatory variables reveals no significant correlation; therefore, the proportion of faculty holding the M.D. degree can be assumed independent of these three variables. The contribution towards R^2 made by any additional variables is insignificant.

Table 4 summarizes the regression equation after these first four steps. As can be seen, 63 percent of the variation in participation rates is accounted for by these four variables. The standard error of the estimate at approximately 8 percent means that roughly two-thirds of the time the error in predicting faculty participation rates, using these four variables, is 8 percent or less. The actual regression coefficients appear in the column headed "B". As can be seen, the first three variables have positive coefficients, and the last variable has a negative coefficient. However, these are only estimates of the true coefficients. The true coefficients can be considered to be within the range of B plus or minus the standard error of B. However, when these ranges are considered, the signs of the regression coefficients do not change.

Potential Refinements

The inclusion of "number of graduate students in the basic sciences " as an explanatory variable may have confounded the results, in that this variable could also be an indicator of institutional size. Therefore, in order to test whether size or emphasis in graduate training in the basic sciences is the contributing factor, a size factor was incorporated into the model. Institutional size was measured by the following three variables: (1) Total Faculty (X^{10}); (2) Total Students (X^{11}); and, (3) Total Regular Operating Expenditures (X^{12}).

Furthermore, the ambiguous nature of the variable "graduate students in the basic sciences" was eliminated.

Table 5 shows the summary table of regression results generated by making the proposed changes in the model. For comparative purposes, a similar table from the original output appears in the bottom half of the table. A comparison of the columns entitled "R SQUARE" indicates that the two models have essentially the same predictive power. Using a 2 percent incremental contribution to R as a cutoff point to determine significant variables, the revised model predicts 64 percent of the variance with 5 variables, while the original model predicts 63 percent of the variance with four variables. However, the loading of the variable "TOTAL FACULTY" in the revised version before either of the variables which seems to measure the emphasis on graduate training in the basic sciences indicates that institutional size is a significant factor in predicting the variation in faculty participation rates in NIH training grants. This

TABLE 4

REGRESSION STATUS AFTER 4 STEPS

SUMMARY STATISTICS

MULTIPLE R	.80
R SQUARE	.63
STANDARD ERROR	8.42

VARIABLES IN THE EQUATION		RAW REGSN COEFFICIENT B	STD ERROR B	F
X_2	Proportion of living active graduates as of 1967 in academic medicine in 1972 at other than graduating school	1.17	.43	7.47
X_5	Graduate students in the basic sciences in 1972	.05	.02	12.47
X_4	Percent of 1972 salaried faculty with previous post-doctoral support	.47	.16	9.01
X_8	Percent of total faculty with MD in 1972	-.29	.15	3.60
(CONSTANT)		12.77		

COMPARISON OF REGRESSION OUTPUTS FOR FACULTY
PARTICIPATION IN NIH TRAINING GRANTS: REFINEMENTS VS. ORIGINAL

REFINEMENT

DEPENDENT VARIABLE.. Y_1 Percent of faculty participating in NIH

		MULTIPLE R	R SQUARE	RSQ CHANGE
X_2	Proportion of living active graduates as of 1967 in academic medicine in 1972 at other than graduating school	.64	.41	.41
X_3	Percent of 1972 salaried faculty with previous pre-doctoral support	.72	.51	.10
X_{10}	Total salaried faculty in 1972	.77	.59	.08
X_4	Percent of 1972 salaried faculty with previous post-doctoral support	.79	.62	.03
X_6	1972 ratio of graduate students in the basic sciences to total students	.80	.64	.02
X_{12}	Regular operating expenditures in 1972	.81	.65	.01
X_1	Proportion of living active graduates as of 1967 ever having been in academic medicine between 1967 and 1972	.81	.66	.01
X_8	Percent of total faculty with MD in 1972	.82	.67	.01
X_9	Percent of 1972 salaried faculty in basic science departments	.82	.67	.00
X_{11}	Number of total students in 1972	.82	.67	.00
X_7	1972 ratio of graduate students in the basic sciences to basic science faculty	[illegible]	.67	.00

ORIGINAL

		MULTIPLE R	R SQUARE	RSQ CHANGE
X_2	Proportion of living active graduates as of 1967 in academic medicine in 1972 at other than graduating school	.64	.41	.41
X_5	Graduate students in the basic sciences in 1972	.74	.54	.13
X_4	Percent of 1972 salaried faculty with previous post-doctoral support	.78	.60	.06
X_8	Percent of total faculty with MD in 1972	.80	.63	.03
X_7	1972 ratio of graduate students in the basic sciences to basic science faculty	.80	.65	.02
X_3	Percent of 1972 salaried faculty with previous pre-doctoral support	.81	.66	.01
X_1	Proportion of living active graduates as of 1967 ever having been in academic medicine between 1967 and 1972	.82	.67	.01
X_9	Percent of 1972 salaried faculty in basic science departments	.82	.68	.01
X_6	1972 ratio of graduate students in the basic sciences to total students	.83	.68	.00

finding does not imply, however, that emphasis on graduate training in the basic sciences is an insignificant factor.

Table 6 shows the correlation matrix corresponding to the revised run. The variable X^7 (graduate students in the basic sciences over total students) has the third highest correlation with the dependent variable. In addition, it is also very highly correlated with the variables X^2, X^3, and X^4, where X^2 is an indicator of the propensity of the school to produce graduates later employed in academic medicine, and X^3 and X^4 represent the experience of the faculty with respect to previous participation in Federal programs (see Table 3 for exact definitions). Since all three of these variables enter the equation before X^7, the strong relationship between X^7 and the dependent variable shows up implicitly in the other explanatory variables incorporated into the equation.

In conclusion, it appears that the addition of an institutional size factor does not improve the predictive power of the equation, although the variable "TOTAL FACULTY" becomes the third entering variable. This refinement implies that the "number of graduate students in the basic sciences" was more reliable as an indicator of institutional size than of emphasis on "graduate training in the basic sciences". Apparently, most of the variation predicted by the emphasis on graduate training in the basic sciences is also predicted by the propensity of the school to produce academically oriented graduates and by the experience of the faculty with respect to previous exposure to pre- and postdoctoral training.

In summary, stepwise-multivariate regressions were run in an attempt to predict the variation in faculty participation rates in NIH training grants across 50 medical schools. The results indicated that four variables predicted 63 percent of the variation. These four variables and their relative contributions are:

1.	Proportion of living active graduates as of 1967 in academic medicine at a school other than graduating school (correlates positvely with dependent variable)	41%
2.	Number of graduate students in the basic sciences in 1972 (correlates positively with dependent variable)	13%
3.	Proportion of 1972 salaried faculty with previous postdoctoral support (correlates positively with dependent variable)	6%
4.	Proportion of faculty holding M.D. in 1972 (correlates negatively with dependent variable)	3%
	TOTAL	63%

TABLE 6

CORRELATION MATRIX FOR FACULTY PARTICIPATION
IN NIH TRAINING GRANTS AND ELEVEN EXPLANATORY VARIABLES

	Y_1	X_1	X_2	X_3	X_4	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
Y_1	1.00 s=.001	.54 s=.001	.64 s=.001	.48 s=.001	.63 s=.001	.46 s=.001	.61 s=.001	-.05 s=.354	-.14 s=.161	.36 s=.005	.23 s=.056	.52 s=.001
X_1	.54 s=.001	1.00 s=.001	.85 s=.001	.04 s=.392	.42 s=.001	.24 s=.046	.42 s=.001	.18 s=.106	-.25 s=.040	.37 s=.004	.15 s=.154	.40 s=.002
X_2	.64 s=.001	.85 s=.001	1.00 s=.001	.27 s=.028	.58 s=.001	.35 s=.006	.53 s=.001	.07 s=.311	-.20 s=.082	.33 s=.010	.16 s=.129	.45 s=.001
X_3	.48 s=.001	.04 s=.392	.27 s=.028	1.00 s=.001	.44 s=.001	.43 s=.001	.53 s=.001	-.27 s=.029	.30 s=.018	-.22 s=.064	-.08 s=.298	.06 s=.330
X_4	.63 s=.001	.42 s=.001	.58 s=.001	.44 s=.001	1.00 s=.001	.30 s=.017	.44 s=.001	.18 s=.103	-.08 s=.302	.20 s=.077	.18 s=.107	.47 s=.001
X_6	.46 s=.001	.24 s=.046	.35 s=.006	.43 s=.001	.30 s=.017	1.00 s=.001	.82 s=.001	-.02 s=.443	-.37 s=.004	.17 s=.123	.29 s=.022	.13 s=.192
X_7	.61 s=.001	.42 s=.001	.53 s=.001	.53 s=.001	.44 s=.001	.82 s=.001	1.00 s=.001	-.08 s=.301	-.09 s=.271	.15 s=.155	.01 s=.462	.18 s=.101
X_8	-.05 s=.354	.18 s=.106	.07 s=.311	-.27 s=.029	.18 s=.103	-.02 s=.443	-.08 s=.301	1.00 s=.001	.02 s=.448	.14 s=.168	.26 s=.034	.15 s=.157
X_9	-.14 s=.161	-.25 s=.040	-.20 s=.082	.30 s=.18	-.08 s=.302	-.37 s=.004	-.09 s=.271	.02 s=.448	1.00 s=.001	-.49 s=.001	-.27 s=.028	-.22 s=.066
X_{10}	.36 s=.005	.37 s=.004	.33 s=.010	-.22 s=.064	.20 s=.077	.17 s=.123	.15 s=.155	.14 s=.168	-.49 s=.001	1.00 s=.001	.69 s=.001	.67 s=.001
X_{11}	.23 s=.056	.15 s=.154	.16 s=.129	-.08 s=.298	.18 s=.107	.29 s=.022	.01 s=.462	.26 s=.034	-.27 s=.028	.69 s=.001	1.00 s=.001	.58 s=.001
X_{12}	.52 s=.001	.40 s=.002	.45 s=.001	.06 s=.330	.47 s=.001	.13 s=.192	.18 s=.010	.15 s=.157	-.22 s=.066	.67 s=.001	.58 s=.001	1.00 s=.001

NOTES: N = 50 medical schools

S = significance level

Refinements were made to test whether the variable "number of graduate students in the basic sciences" was truly a measure of emphasis on graduate training in the basic sciences rather than an indicator of institutional size. Results of the refinements indicated that this variable was perhaps a better measure of institutional size. Emphasis on graduate training in the basic sciences may be implicitly accounted for by a school's propensity to produce academicians and the experience of the faculty with regard to previous exposure to predoctoral and postdoctoral training.

CHAPTER 4

Faculty Participation in Other Federal Programs

Because of the manner in which the faculty profile questionnaire deals with faculty participation in Federal programs, the category, "other Federal programs" includes all Federal government programs other than NIH training grants. It includes programs targeted for research, training, patient care, or a combination of the three. However, the majority of these programs are research oriented. A list of sponsoring Federal agencies as well as a list of various programs included under "other Federal programs" appears in Appendix A.

In 1971-72, there were 11,503 salaried faculty participating in "other Federal programs". Figure 4 shows the distribution of these faculty members by sponsoring agencies. More than two-thirds of the participating faculty are involved in NIH-sponsored programs. For those faculty members participating in NIH-sponsored programs, and for whom the program type is known, the distribution by program type is shown in Figure 5. This figure shows that 90 percent of the faculty participating in NIH-sponsored programs were participating in some type of research program. The combined results of Figures 4 and 5 indicate that more than 60 percent of the faculty participating in "other Federal programs" in 1972 were participating in NIH sponsored research programs.

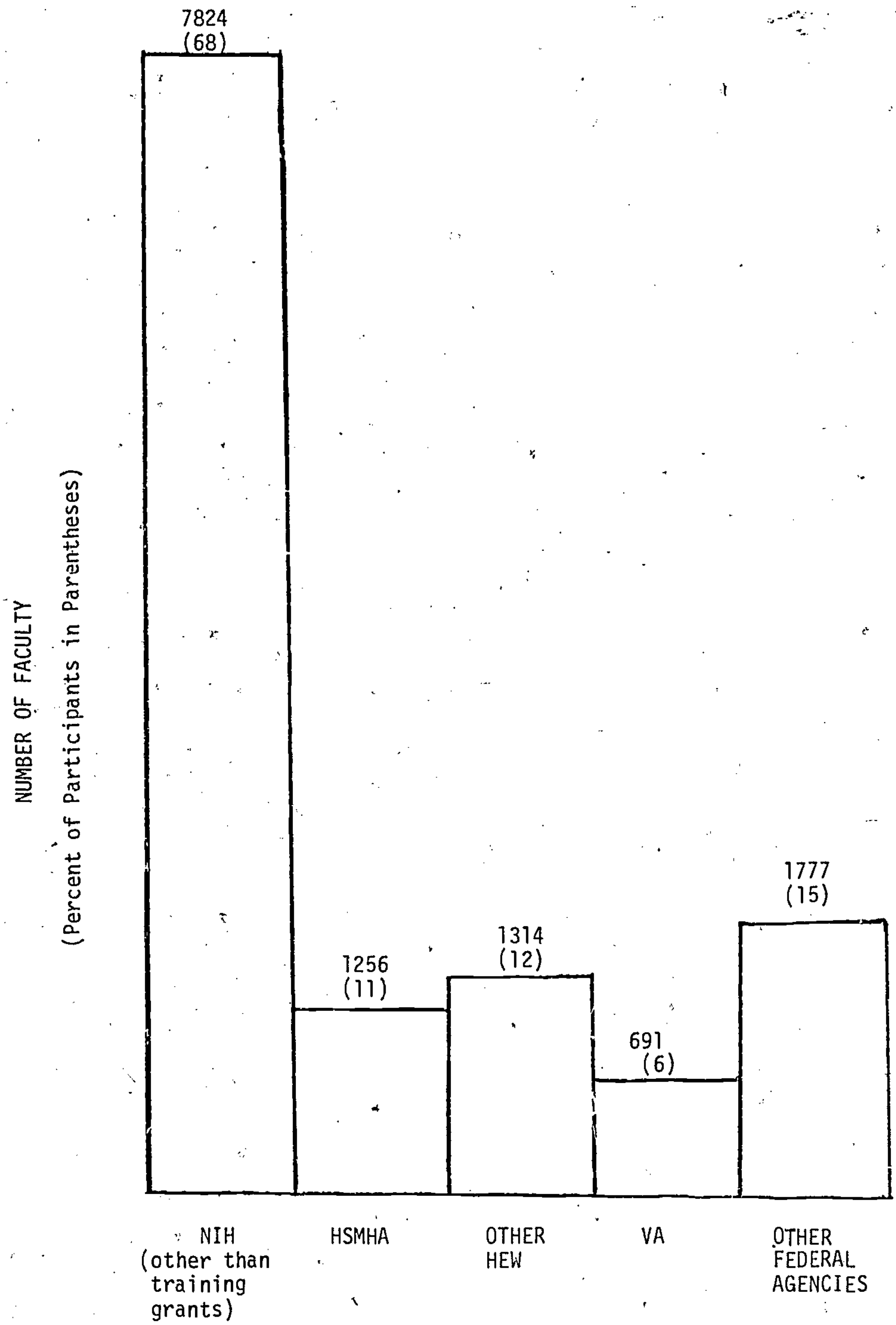
Faculty Participation in Other Federal Programs By Institution

Figure 6 depicts the faculty participation rates for "other Federal programs" for the 50 schools used in the analysis described in Chapter 3. (See Appendix C for a list of included schools). These participation rates were calculated by dividing the number of faculty participating in "other Federal programs" by the total number of faculty responding to this question. The figure indicates that the participation rates range from 10 percent to as high as 70 percent with an average of about 40 percent. As with NIH training grants, the spread in faculty participation in "other Federal programs" is quite substantial. In the next section, the same regression model developed in Chapter 3 will be used in an attempt to explain the variation in "other Federal program" participation rates.

FIGURE 4

DISTRIBUTION OF FACULTY PARTICIPATION IN OTHER FEDERAL PROGRAMS BY SPONSORING AGENCY

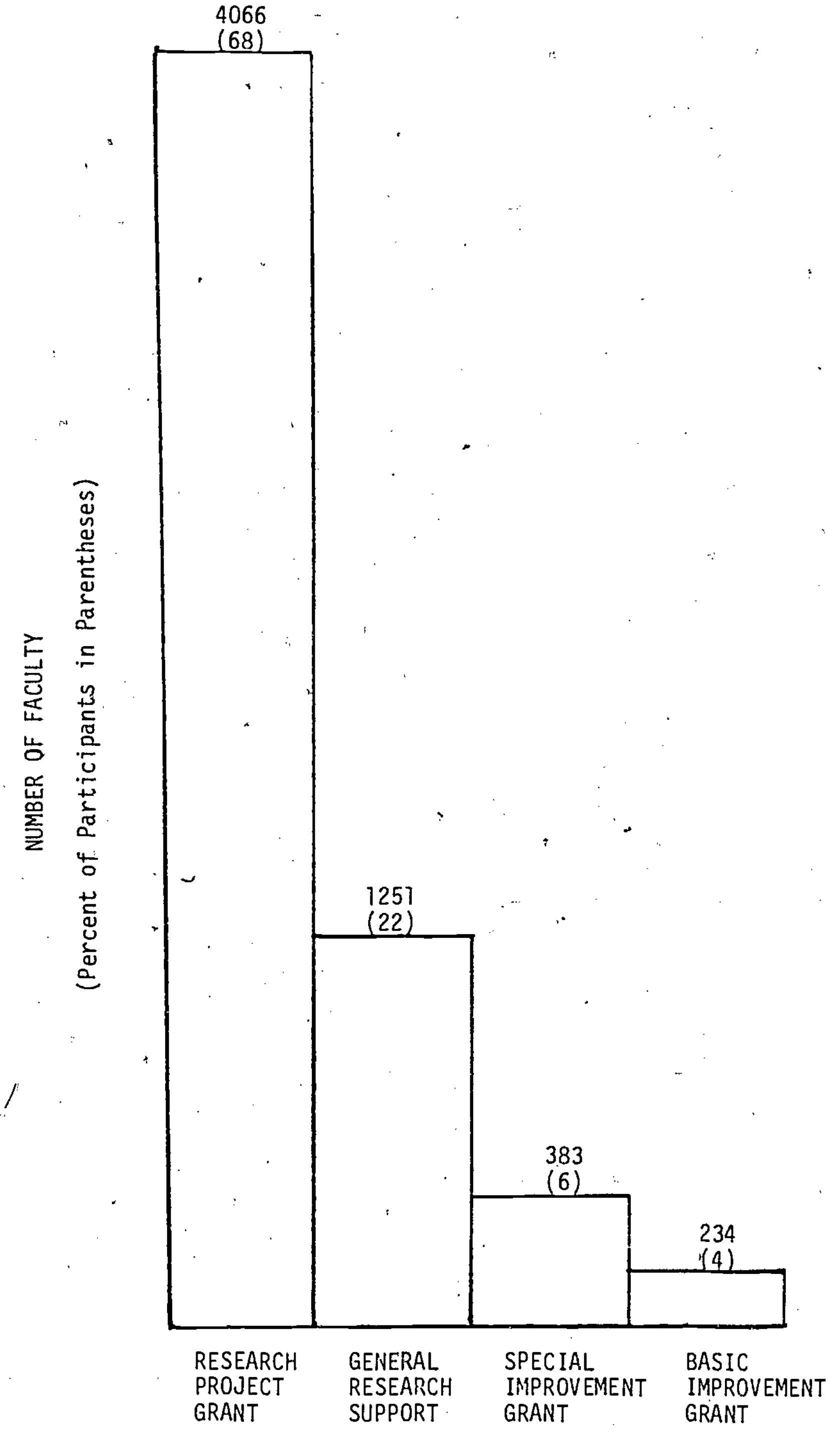
FY 1972



N=11503 faculty

FIGURE 5

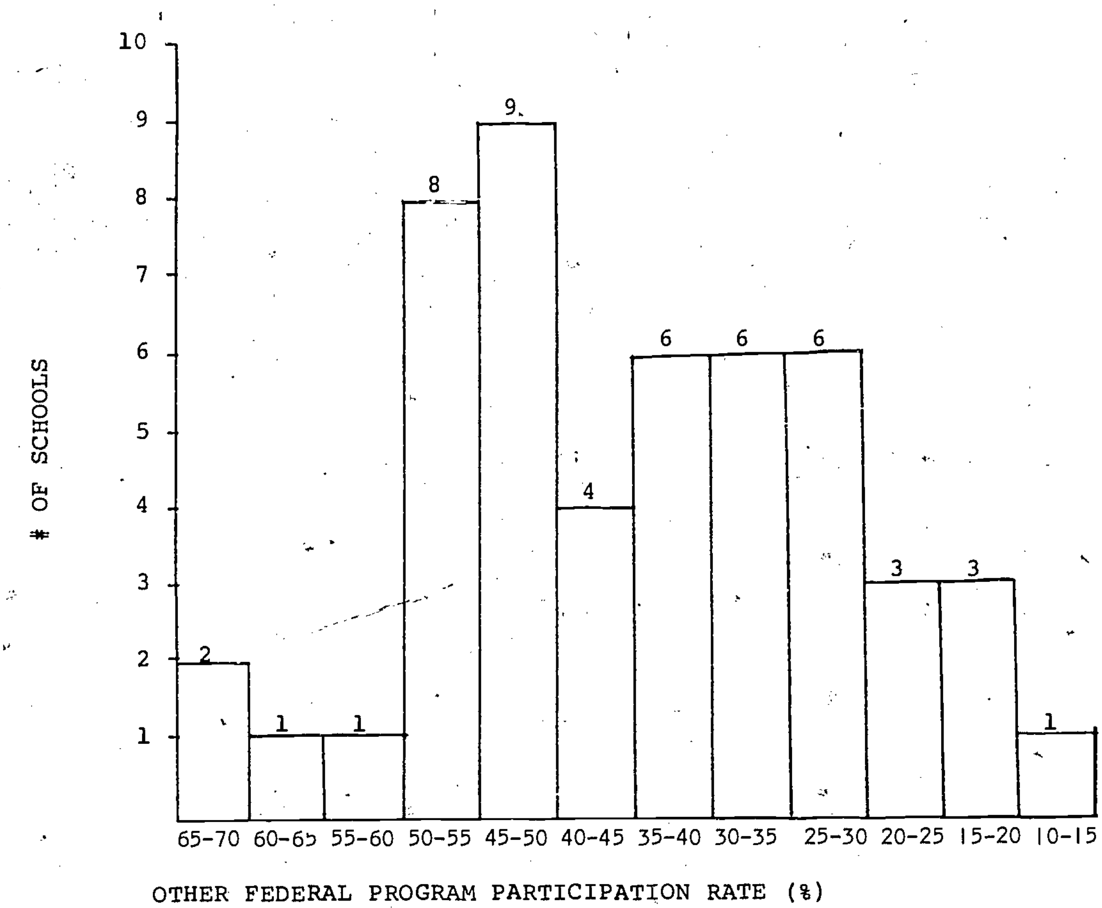
DISTRIBUTION OF FACULTY PARTICIPATION IN NIH SPONSORED PROGRAMS BY TYPE OF GRANT FY 1972



N=5934 faculty

FIGURE 6

DISTRIBUTION OF FACULTY PARTICIPATION RATES
IN OTHER FEDERAL PROGRAMS
FOR 50 MEDICAL SCHOOLS



Regression Results

The four institutional factors presented in Chapter 3 were used to predict faculty participation in "other Federal programs". The correlation coefficients between the dependent variable (Y^2) and the explanatory variables are displayed in Table 7. A comparison of these results with those in Table 1 may indicate that the model will not be as powerful for faculty participation in "other Federal programs" as it was for faculty participation in NIH training grants.

Table 8 presents a summary table of regression results. Only two variables made a significant contribution towards predicting the variation in the dependent variable. These two variables were:

X^4 percent of faculty with postdoctoral support histories (correlates positively with dependent variable);

X^8 percent of faculty with M.D. degree (correlates negatively with dependent variable).

Together, these two variables accounted for 39 percent of the variance.

Both of these relationships have logical explanations. Since postdoctoral training programs are geared towards research training, schools at which a relatively high proportion of faculty members have undergone postdoctoral training would also have a relatively high proportion of faculty members participating in federally sponsored research programs. With regard to the second relationship, institutions at which a low proportion of faculty hold M.D.'s would also have a high proportion of faculty holding Ph.D.'s. Since Ph.D.'s are more likely to be involved in research activities than M.D.'s, it follows that there would be a negative correlation between the proportion of faculty holding M.D.'s and the rate of faculty participating in "other Federal programs".

However, the model did not predict variation in faculty participation in "other Federal programs" as well as it predicted faculty participation in NIH training grants. As mentioned previously, most of these "other Federal programs" are NIH-sponsored research programs. The decision to award funds under these programs is essentially a function of the potential merits of an individual investigator's proposed research as determined by peer review and other processes. Since the awards are at the individual investigator level rather than the institutional or departmental level, it might be expected that a predictive model of faculty participation in "other Federal programs" utilizing institutional characteristics would be inferior to a model

TABLE 7

CORRELATION MATRIX FOR FACULTY PARTICIPATION IN OTHER FEDERAL PROGRAMS AND 9 EXPLANATORY VARIABLES

	Y_2	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Y_2	1.00 s= .001	.23 s= .053	.36 s= .005	.44 s= .001	.46 s= .001	.20 s= .078	.14 s= .173	.24 s= .049	-.33 s= .009	-.03 s= .420
X_1	.23 s= .053	1.00 s= .001	.85 s= .001	.04 s= .392	.42 s= .001	.31 s= .014	.24 s= .046	.42 s= .001	.18 s= .106	.25 s= .040
X_2	.36 s= .005	.85 s= .001	1.00 s= .001	.27 s= .028	.58 s= .001	.39 s= .003	.35 s= .006	.53 s= .001	.07 s= .311	-.20 s= .082
X_3	.44 s= .001	.04 s= .392	.27 s= .028	1.00 s= .001	.44 s= .001	.39 s= .003	.43 s= .001	.53 s= .001	-.27 s= .029	.30 s= .018
X_4	.46 s= .001	.42 s= .001	.58 s= .001	.44 s= .001	1.00 s= .001	.36 s= ,005	.30 s= .017	.44 s= .001	.18 s= .103	-.08 s= .302
X_5	.20 s= .078	.31 s= .014	.39 s= .003	.39 s= .003	.36 s= 005	1.00 s= .001	.85 s= .001	.77 s= .001	.10 s= .244	-.21 s= .071
X_6	.14 s= .173	.24 s= .046	.35 s= .006	.43 s= .001	.30 s= 017	.85 s= .001	1.00 s= .001	.82 s= .001	-.02 s= .443	-.37 s= .004
X_7	.24 s= .049	.42 s= .001	.53 s= .001	.53 s= .001	.44 s= .001	.77 s= .001	.82 s= .001	1.00 s= .001	-.08 s= .301	-.09 s= .271
X_8	-.33 s= .009	.18 s= .106	.07 s= .311	-.27 s= .029	.18 s= .103	.10 s= .244	-.02 s= .443	-.08 s= .301	1.00 s= .001	.02 s= .448
X_9	-.03 s= .420	-.25 s= .040	-.20 s= .082	.30 s= .018	-.08 s= .302	-.21 s= .071	-.37 s= .004	-.09 s= .271	.02 s= .448	1.00 s= .001

N = 50 Medical Schools

S = Significance level

TABLE 8

SUMMARY TABLE OF REGRESSION RESULTS FOR FACULTY

PARTICIPATION IN OTHER FEDERAL PROGRAMS

DEPENDENT VARIABLE... Y_2 PERCENT OF FACULTY PARTICIPATION IN OTHER FEDERAL PROGRAMS

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE
X_4	- Percent of 1972 salaried faculty with previous post-doctoral support	.46	.21	.21
X_8	- Percent of total faculty with MD in 1972	.62	.39	.18
X_3	- Percent of 1972 salaried faculty with previous pre-doctoral support	.63	.40	.01
X_1	- Proportion of living active graduates as of 1967 ever having been in academic medicine between 1967 and 1972	.64	.41	.01
X_7	- 1972 ratio of graduate students in the basic sciences to total students	.66	.43	.02
X_5	- Graduate students in the basic sciences in 1972	.67	.45	.02
X_6	- 1972 ratio of graduate students in the basic sceinces to basic science faculty	.68	.46	.01
X_9	- Percent of 1972 salaried faculty in basic science departments	.68	.46	.00
X_2	- Proportion of living active graduates as of 1967 in academic medicine in 1972 at other than graduating school	.68	.46	.00

utilizing individual characteristics. Interestingly enough, the two variables which made a significant contribution in the model presented above were both individual characteristics cumulated up to the institutional level.

For purposes of comparison, it is important to note that NIH training grants are awarded at the departmental level. The department decides which faculty members will participate in the training process. Perhaps this difference in the granting process is the best explanation for the superiority of the model in predicting an institution's rate of faculty participation in NIH training grants as compared to an institution's rate of faculty participation in other Federal programs.

Also, it must be remembered that "other Federal programs" do not consist solely of NIH-sponsored research programs. Programs of other Federal agencies fall into this category, as do non-research programs of NIH. Each of these programs differs in focus. Some are very narrow in scope; others, very broad in terms of objectives. For example, the Atomic Energy Commission tends to concentrate its programs in radiology departments, while NIH basic improvement grants, sometimes considered to be the forerunner of capitation grants, are usually thought of as instruments of general institutional support. Clearly these "other Federal programs" are extensive in terms of diversity and scope, especially when compared to NIH training programs. It follows then, that a regression model built specifically to relate to the stated objectives of the NIH training programs would fall short in predicting the variation in faculty participation rates in "other Federal programs".

Potential Refinements

In Chapter 3, a refinement was presented in order to clarify the significance of the variable "number of graduate students in the basic sciences." It was not clear whether this variable was an indicator of institutional size or of an emphasis on graduate training in the basic sciences. In order to provide clarification, this variable was dropped and pure size variables were added. These variables were: 1. Total faculty (X^{10}); 2. Total students (X^{11}); and, 3. Total operating expenses (X^{12}).

For purposes of consistency, the same refinement was made to the "other Federal programs" model. The results are shown in Table 9. Since the same two variables are significant, this alteration has no effect on the results. Because institutional size is a purely institutional characteristic, it is reasonable that it made no significant contribution towards predicting the variation in faculty participation in "other Federal programs".

TABLE 9

SUMMARY TABLE OF REGRESSION RESULTS FOR FACULTY PARTICIPATION IN OTHER FEDERAL PROGRAMS WITH REFINEMENT FOR INSTITUTIONAL SIZE

DEPENDENT VARIABLE... Y_2 PERCENT OF FACULTY PARTICIPATING IN OTHER FEDERAL PROGRAMS

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE
X_4	- Percent of 1972 salaried faculty with previous post-doctoral support	.46	.21	.21
X_8	- Percent of total faculty with MD in 1972	.62	.39	.18
X_3	- Percent of 1972 salaried faculty with previous pre-doctoral support	.63	.40	.01
X_1	- Proportion of living active graduates as of 1967 ever having been in academic medicine between 1967 and 1972	.64	.41	.01
X_7	- 1972 ratio of graduate students in the basic sciences to total students	.66	.43	.02
X_{10}	- Total salaried faculty	.66	.44	.01
X_{11}	- Number of total students	.68	.46	.02
X_6	- 1972 ratio of graduate students in the basic sciences to basic science faculty	.68	.46	.01
X_9	- Percent of 1972 salaried faculty in basic science departments	.69	.48	.01
X_2	- Proportion of living active graduates as of 1967 in academic medicine in 1972 at other than graduating school	.69	.48	.00

In summary, "other Federal programs" were shown to consist mostly of research programs sponsored by NIH. Multivariate regressions were run in an attempt to predict the variation in faculty participation rates in "other Federal programs" across 50 medical schools. The results indicated that two variables predicted 39 percent of the variance. These two variables and their relative contributions are:

1.	percent of faculty with previous post-doctoral support (correlates positively with dependent variable);	21%
2.	percent of faculty holding M.D.'s (correlates negatively with dependent variable).	18%

Because both of these variables are indicators of the research orientation of faculty, the discovered relationships were logically explained.

The model was not as successful in predicting faculty participation in "other Federal programs" as it was in predicting faculty participation in NIH training grants. Two possible reasons were cited in an attempt to explain these differing results. First, it was pointed out that the relative lack of success in predicting faculty participation in "other Federal programs" may be partially attributable to the use of institutional descriptors to explain a phenomenom which is probably more a function of an individual faculty member's personal and professional characteristics. Secondly, the wide range of programs within the category of "other Federal programs", some with divergent objectives and scopes, makes prediction of faculty participation in "other Federal programs" difficult with variables developed to explain faculty participation in NIH training grants.

CHAPTER 5

SUMMARY AND CONCLUSIONS

In Chapter 3, a multivariate regression model was presented to explain the variation in faculty participation rates in NIH training grants across 50 medical schools. One variable, percent of total living active graduates as of 1967 in academic medicine in 1972 at a school other than the school of graduation, explained 41 percent of the variation in the dependent variable and implied that there is a strong relationship between the level of faculty participation in NIH training grants and the production of academicians. Since medical school faculty members are generally involved in biomedical research as well as the training of M.D.'s, this relationship was felt to be consistent with the two NIH objectives for training programs cited in Chapter 3; namely, to maintain a superior national program of biomedical research and to increase the production of well-trained health manpower for service.

In Chapter 4, the same multivariate regression model developed in Chapter 3 was applied to faculty participation in "other Federal programs". These "other Federal programs" were shown to consist mostly of research programs sponsored by NIH. Two variables, percent of faculty with previous postdoctoral support and percent of faculty holding M.D.'s, were found to make a significant contribution towards predicting the variation in faculty participation in "other Federal programs" across medical schools. However, these two variables accounted for only 39 percent of the variation. The relative lack of success was attributed to two reasons: 1) use of institutional variable to explain a phenomenon which is probably more closely related to an individual faculty member's personal and professional attributes, and 2) the diversity of programs within the category "other Federal programs".

In the case of the NIH training grants, there were broadly stated objectives which the training programs were designed to accomplish. In Chapter 3, an attempt was made to quantify these objectives into measurable dimensions and to test hypothesized relationships thought to be consistent with these objectives. In general if the objectives are stated for a specific program, this type of modeling effort can then be used to determine the degree to which this program is meeting it's objectives. With regard to the NIH training grants, the modeling effort presented here discovered some relationships which were deemed to be consistent with previously stated goals.

For the model presented in Chapter 3, it is certainly possible that through the annexation of additional variables or through the refinement of variables already incorporated into the model, the predictive power of the model could be improved. However, the important point is that there are institutional characteristics which can be quantified and viewed in relation to the objectives of a specific program. These variables can then be combined through such mathematical techniques as multiple regression in order to provide a decision making tool for evaluating the performance of a specific program in relation to its stated objectives.

With regard to the modeling effort detailed in Chapter 4, it is important to note that the predictive power of the model was much greater for NIH training grants than it was for "other Federal programs". It was felt that this difference was largely due to the differences in allocation procedures for the two types of programs. NIH training grants are allocated to the department of the institution, and the decision regarding who is to be trained and who is to do the training is made at the departmental level. The "other Federal programs", which are mostly NIH-sponsored research programs, are generally allocated to the individual investigator and depend upon a number of factors. A mathematical model utilizing institutional characteristics can better predict faculty participation in NIH training grants than faculty participation in "other Federal programs".

Recommendations For Future Research

The appropriate role of the Federal government in supporting the training of biomedical research personnel has long been a topic of debate. Although the authority for new "traditional" grants has expired, NIH continues to administer training programs under three separate authorities. Additional objective research aimed at evaluating the performance of these training programs is clearly needed.

The model presented in Chapter 3 is a step in that direction. However, the data used for that model was taken from the 1971-72 school year. Perhaps a similar model should be built for a more recent year. If such a model is built, it might be useful to measure the level of a school's participation in training programs, not only by the proportion of faculty participating, but also by the actual dollars flowing into the medical school under the authority of specific programs.

It is recommended that future modeling efforts be undertaken to provide a more current explanation of the level of medical schools' participation in specific training programs. These future efforts should explore different methods of measuring an institution's participation, as well as possible new explanatory variables to be used for prediction.

With regard to the findings of Chapter 4, it is recommended that a model based on individual characteristics be developed to predict the variation in faculty participation in "other Federal programs". In such a model, perhaps the dependent variable should be limited to only NIH research programs, thus eliminating the confounding effects of programs of other Federal agencies which may or may not be research oriented. Assuming that participation in an NIH research program is a function of characteristics of the individual faculty member, perhaps the problem should be initially attacked through discriminant analysis. Utilization of this technique could determine which individual characteristics best account for the reasons some faculty participate in research programs and other do not. The results of such a discriminant analysis could then be used as input to a multivariate regression model to predict the variation in faculty participation in research programs across medical schools.

FOOTNOTES

[1] In 1973, HSMHA was dissolved as part of the Public Health Service reorganization. In general, HSMHA's component organizational entities can now be found within the Health Services Administration (HSA) and the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA).

[2] The Training Programs of the Institutes of the National Institutes of Health, Fiscal Year 1974, Volume I, Office of the Director, NIH, October, 1972, pg. 11.

[3] Ibid, pg. 5.

[4] Theodore, C. N., Medical School Alumni, 1967. American Medical Association, Chicago, 1968. Table 2, pp. 119-164. For each school, the number of graduates as of 1967 was calculated as total graduates minus inactive graduates.

APPENDIX A

FACULTY PROFILE SYSTEM DATA COLLECTION INSTRUMENT FOR FACULTY PARTICIPATION IN FEDERAL PROGRAMS.

CURRENT PARTICIPATION IN NIH TRAINING GRANTS (exclude NIMH): (Use one line per training grant)

		DISCIPLINE (Select From Specialty/Discipline List) (a)	DIRECTOR (b)	STAFF (c)	Salary Support Yes (d)	Salary Support No (e)
64 NONE ☐	65					
	66					
	67					

CURRENT PARTICIPATION IN OTHER FEDERAL PROGRAMS: (Including NIH)
(Select responses for Federal Agency and Name of Sponsoring Agency's Program from the lists below.)

		FEDERAL AGENCY (a)	NATURE OF PROGRAM ACTIVITY (b)				NAME OF SPONSORING AGENCY'S PROGRAM (c)	Salary Support	
			Teaching	Research	Patient Care	Other		Yes (d)	No (e)
68 NONE ☐	69								
	70								
	71								
	72								
	73								

FEDERAL AGENCY (From Which Funds Are Received)

	Abbreviations	
02	NIH	National Institutes of Health
04	HSMHA-RMP	Health Services & Mental Health Admin.-Regional Medical Program
06	HSMHA-Other	Health Services & Mental Health Admin.-Other (incl. NIMH)
07	CPEHS	Consumer Protection & Environmental Health Service
08	SRS	Social Rehabilitation Service
10	SSA	Social Security Admin.
11	OE	Office of Education
12	DHEW-Other	All other-Dept. Health, Education & Welfare
14	OEO	Office of Economic Opportunity
16	VA	Veterans Administration
18	NSF	National Science Foundation
20	AEC	Atomic Energy Commission
22	NASA	National Aeronautics & Space Admin.
24	DOD	Dept. of Defense
26	Fed-Other	Federal - Other (Specify)

NAME OF SPONSORING AGENCY'S PROGRAM
(Should designate sponsoring agency's program in which faculty member participates)

	Abbreviations	
01	BIG	NIH basic improvement grant
03	SIG	NIH special improvement grant
05	GRSG	NIH general research support grant
07	RPG	NIH research project grant or contract
09	PAP	Physician augmentation program
11	RMP	Regional Medical Program
13	MIC	Maternal & infant care center
15	CYC	Children & youth center
17	CHC	Community health center
19	Comp HC	Comprehensive health center
23	RCDA	Research career development award
25	HSMHA	HSMHA neighborhood health center
27	Other-DHEW	Other DHEW research grants or contracts
29	Other-Fed.	Other Federal research grants or contracts

APPENDIX B

FACULTY PARTICIPATION IN FEDERAL PROGRAMS, BY DEPARTMENT

RANKED LISTS OF DEPARTMENTS BY PERCENTAGE
OF FACULTY PARTICIPATING IN FEDERAL PROGRAMS

NIH TRNG. GNTS. Dept.	(Fac.Part'ng / Fac.Respdn'ts) %	OTHER FED. PROGS. Dept.	(Fac.Part'ng / Fac.Respondn'ts) %	TOTAL FED PGMS Depts.	(Fac.Part'ng / Fac.Respondn'ts) %
1. Genetics	61.1	1. Biophysics	81.3	1. Biophysics	87.5
2. Neurology	54.1	2. Genetics	71.6	2. Genetics	83.5
3. Otolaryngology	51.5	3. Biochemistry	67.8	3. Pharmacology	75.9
4. Biophysics	50.0	4. Rehab	66.6	4. Microbiology	73.6
5. Opthomology	46.2	5. Pharmacology	66.2	5. Biochemistry	72.6
6. Pharmocology	46.0	6. Microbiology	64.3	6. Neurology	71.7
7. Microbiology	41.2	7. Physiology	61.9	7. Rehab.	69.5
8. Psychiatry	39.7	8. Biometry	49.5	8. Physiology	68.9
9. Physiology	36.8	9. Physical Med.	48.1	9. Biometry	63.8
10. Biochemistry	33.3	10. Community Med	47.7	10. Otolaryngology	62.3
11. Molecular Biology	31.2	11. Anatomy	47.2	11. Opthomology	60.8
12. Dermatology	29.6	12. Neurology	46.8	12. Mole. Biology	57.4
13. Medicine	29.4	13. Mol. Biology	45.7	13. Psychiatry	57.1
13. Biometry	29.4	14. Pediatrics	45.6	14. Anatomy	56.5
15. Anatomy	29.0	15. Medicine	44.0	15. Comm. Medicine	55.8
16 Pathology	24.1	16. Dermatology	40.0	16. Physical Med.	54.5
17. Anesthesiology	23.2	17. Opthalmology	38.1	17. Medicine	53.6
18. Community Med.	22.0	18. Admin.	37.3	18. Pediatrics	51.7
19. Surgery	18.5	19. Other	35.6	19. Dermatology	50.3
20. Radiology	18.3	20. Obstetrics	33.1	20. Pathology	42.3
21. Pediatrics	17.4	21. Pathology	31.1	21. Admin.	40.6
22. Allied Health	11.8	22. Allied Health	30.8	22. Other	37.2
23. Physicial Med.	10.6	23. Otolaryngology	30.6	23. Allied Health	37.1
24. Administration	10.5	24. Surgery	28.7	24. Surgery	36.4
25. Orthopedic Surg.	9.6	25 Psychiatry	28.6	25. Obstetrics	36.1
26. Obstetrics	7.7	26. Orthoped.Surg	23.7	26. Radiology	31.7
27. Other	7.7	27. Radiology	23.3	27. Anesthesiology	31.4
28. Rehab.	4.5	28 Anesthesiology	19.4	28. Orthopedic Surg.	25.8
Avg. Over all Departments	27.5	Avg. Over all Departments	41.0	Avg. Over all Departments	52.1

FACULTY PARTICIPATION IN FEDERAL PROGRAMS BY DEPARTMENT TYPE

FY 1972

NIH TRAINING GRANTS	Tot. Fac.	Respondents	Participants	(Par/Res)%	Sal Supt.	(Sal Supt/Partic.)%
BASIC	8750	7347	2494	34	511	21
CLINICAL	24646	19715	5108	26	2349	46
OTHER	1049	882	80	9	24	30
TOTAL	34445	27944	7682	28	2884	38
OTHER FEDERAL PGMS						
BASIC	8750	7406	4008	54	2461	61
CLINICAL	24646	19795	7174	36	4722	66
OTHER	1049	882	321	36	193	60
TOTAL	34445	28083	11503	41	7376	64
TOTAL CURRENT						
BASIC	8750	7512	4699	63	2722	58
CLINICAL	24646	20099	9704	48	6357	66
OTHER	1049	890	343	39	205	60
TOTAL	34445	28501	14741	52	9284	63

Source: Faculty Roster 1972

APPENDIX C

MEDICAL SCHOOLS IN REGRESSION ANALYSIS

Medical Schools in Regression Analysis

Alabama
University of South California
UCLA
Cal-Irvine
Colorado
Yale
Howard
Miami
Medical College of Georgia
Emory
University of Chicago
Chicago Med
Loyola
Indiana
Iowa
Louville
Kentucky
LSU-New Orleans
Wayne State
University of Minnesota
University of Mississippi
Missouri-Columbia
St. Louis University
Nebraska
Creighton
Columbia
Suny-Buffalo
Suny-Downstate
Suny-Upstate
Rochester
North Carolina
Bowman Gray
Duke
Case Western
Ohio State
Cincinatti
Oklahoma
Oregon
University of Pennsylvania
Medical College of Pennsylvania
Pittsburgh
Puerto Rico
South Carolina
Texas Galveston
Baylor
Texas Southwestern
Utah
Virginia
Medical College of Virginia
University of Wisconsin