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ABSTRACT

The research methodology developed in this paper was intended to shed some light on the question of career performance differentials within academic medicine between persons who have undergone postdoctoral training and those who have not. Compared were two groups of medical school faculty members (including M. D.'s and Ph.D.'s). One group included those who completed postdoctoral work before 1968. The second group was composed of those with no post doctoral support. The two groups of faculty members were compared on the following indicators of academic performance: (1) academic rank in 1972; (2) research orientation of the employing medical school in 1972; (3) research responsibility in 1972; (4) participation in NIH training grants in 1972; and (5) participation in other federal research programs in 1972. The M. D. postdoctorals outscored the M. D. nonpostdoctorals on all four performance criteria. The score differences were found to be statistically significant for all but the second criterion. An analysis of Ph. D.'s in academic medicine found roughly twice as many M. D.'s in academic medicine as there are Ph.D.'s. The Ph.D. postdoctorals outscored the Ph.D. nonpostdoctorals on all academic performance criteria, but only two of these differences were statistically significant. Although it is not possible to conclude that exposure to postdoctoral training results in better career performance in academic medicine, it is certainly not possible to reject that notion. (Author/KE)

POSTDOCTORALS VS NON-POSTDOCTORALS: CAREER PREFORMANCE DIFFERENTIALS WITHIN ACADEMIC MEDICINE

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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.

Postdoctorals vs Non-Postdoctorals: Career Performance Differentials Within Academic Medicine

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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.

This report "Postdoctorals vs. Non-postdoctorals: Career Performance Differentials Within Academic Medicine", is one of five reports covering various aspects of medical school faculty which has been prepared by the AAMC under its contract with BHRD. It reflects the high Federal investment in biomedical research, which makes it both appropriate and necessary to insure that there are sufficient numbers of well-trained personnel to perform that research. A major, but not sole, purpose of the National Institutes of Health (NIH) postdoctoral support program has been to increase the pool of well-qualified medical researchers. The present study examines how effective this program has been in developing medical researchers by studying what happens to individuals after their training is completed and how their career performance compares to that of their colleagues who did not undergo such training.

For this comparative study of academic performance, two groups of medical school faculty members (including M.D.'s and Ph.D.'s) were chosen. The first group included those who completed postdoctoral work before 1968, with all such work sponsored by NIH. The second group was composed of those with no postdoctoral support. Selection to both groups also included the following criteria: 1) First appointment to academic medicine was in 1967; 2) entire employment was full time in medicine: 3) full-time employment in

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

academic medicine in 1972; 4) age between 20 and 40; and 5) non-minority male who earned M.D. or Ph.D. in the United States.

The two groups of faculty members were compared on the following indicators of academic performance: 1) academic rank in 1972; 2) research orientation of the employing medical school in 1972; 3) research responsibility in 1972; 4) participation in NIH training grants in 1972; and 5) participation in other Federal research programs in 1972.

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.

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INTRODUCTION

The appropriate Federal role in supporting the training of biomedical research personnel has long been a topic of debate. The Office of Management and Budget, among others, argues that it is improper for the federal government to subsidize the training costs of individuals who will enter the relatively lucrative field of biomedical research,[1] while spokesmen for the National Institutes of Health maintain that the annual federal investment of approximately two billion dollars in biomedical research makes the availability of sufficient and well trained personnel to perform that research imperative.[2]

At the heart of this debate is the issue of career performance of those persons who have received biomedical research training support. What happens to these individuals after their training is completed? Do they in fact enter biomedical research careers? How does their career performance compare to that of their colleagues who have not undergone such training? In general, how effective have biomedical research training programs been in providing well trained biomedical researchers?

Background - The NAS/NRC Approach

One recent research effort dealing with evaluating the career performance of postdoctoral trainees* and fellows* in the biomedical sciences was conducted by the National Research Council of the National Academy of Sciences. The study, entitled Postdoctoral Training in the Biomedical Sciences, evaluated the postdoctoral traineeship and fellowship programs sponsored by the National Institute of General Medical Sciences (NIGMS).[3]

The methodology employed by the NAS/NRC study compared the performance of NIGMS postdoctoral trainees and fellows with a group of non-NIGMS postdoctorals. Separate analyses were conducted for M.D.'s and Ph.D.'s. For M.D.'s, the control group was a random sample selected from the AMA master file of physicians. This control group was drawn from the same medical school graduation cohorts as the NIGMS M.D. postdoctorals. For Ph.D.'s, the major control group was a "select sample" of Ph.D.'s drawn from the Doctorate Records File of the National Research Council's Office of Scientific Personnel.** This "select sample" was chosen to match the NIGMS Ph.D. postdoctorals with respect to time

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*. See Appendix C for Definitions

**The Office of Scientific Personnel is now the Commission on Human Resources

of graduation, field of specialization, institute of doctorate, and sex. In general, the comparison criteria included: (1) engagement in research as a primary activity; (2) employment by medical schools and graduate schools; (3) advancement up the academic ladder; (4) winning of competitive research grants; (5) publications and citations in the scientific literature. These five criteria appeared to be relevant measures of performance for persons engaged in scholarly pursuits. Findings of the study generally indicated that for both Ph.D.'s and M.D.'s, the NIGMS postdoctoral trainees and fellows outperformed the control groups. However, while the replies to questions (1), (2), (4) and (5) above indicate that trainees do pursue academic or research careers to a greater extent than others, there is surely a self-selection process at work. Those with an interest in academic or research careers are more likely to apply for and be selected for training programs. Rather than compare postdoctorals with non-postdoctorals on these measures of performance, it might be informative to compare postdoctorals holding faculty appointments with non-postdoctorals holding faculty appointments. In other words, performance comparisons using achievement measures relating to academic careers would be conducted with groups of people holding faculty appointments.

The AAMC Approach

The ultimate question to be addressed is whether NIH postdoctorals perform differently from non-postdoctorals within the realm of academic medicine. Experimentally, it is necessary to define two groups of faculty. Both groups should have exactly the same characteristics at the time of initial appointment, except that one group will have been ex-postdoctorals and the other will have had no exposure to any postdoctoral training. These two groups will then be compared on academic performance indicators five years after their first appointment. The data source for the study was the AAMC Faculty Profile for 1972, which is described in more detail in the following section. A faculty member was included in this study if:

1) His first appointment to academic medicine was in 1967.
2) His entire employment experience has been full-time* in academic medicine*.
3) He held a full-time appointment in academic medicine in 1972.
4) He was between 20 and 40 years old in 1967.
5) He is a non-minority* male who earned his advanced degree (M.D. or Ph.D.) in the United States.
6) a) He completed a postdoctoral appointment before 1968. Furthermore, all his postdoctoral work was sponsored by NIH; or
   b) He never received any postdoctoral support, either before or during his career in academic medicine.

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* See Appendix C for definitions

The first three selection criteria insure that the entire employment experience of each person in the sample was full-time faculty status in academic medicine between 1967 and 1972 and therefore each person in the sample has had equivalent chances of promotion. Since the data base included a few faculty members over forty years old in 1967 who indicated that they had no employment experience prior to 1967 the fourth criterion was needed to insure data reliability. The fifth criterion eliminated any potential bias with regard to sex, race, or nationality. The sixth criterion defined the differences between the "treatment group" and the "control group".

These groups (M.D. postdoctorals vs. M.D. non-postdoctorals and Ph.D. postdoctorals vs. Ph.D. non-postdoctorals) were then compared on the following academic performance indicators:

1) Academic Rank held in 1972;
2) Research Orientation* of Employing Medical School in 1972;
3) Research as an Area of Responsibility in 1972;
4) Participation in NIH Training Grants in 1972;
5) Participation in Other Federal Programs (Research Programs) in 1972.

These indicators were all directly recoverable from the AAMC Faculty Profile for 1972. The results of the comparisons appear in Chapter 2 for the M.D.'s and in Chapter 3 for the Ph.D.'s.

The Data Base

All data for this study was extracted from the AAMC Faculty Profile for 1972. This data file contains biographical information for all salaried faculty holding appointments in U.S. medical schools in 1972. Information regarding postdoctoral training histories is directly recoverable from this file. However, for any postdoctoral program in which a medical school faculty member has participated, only the source of support and not the type of program is known. Therefore, it is impossible to distinguish between fellowships and traineeships. Because the most detailed level of acceptable response to the source of support question is NIH, it is not possible to identify postdoctorals sponsored by any particular institute within NIH. Therefore, the "treatment group" for the study consists of NIH supported postdoctorals. The Faculty Profile Questionnaire appears in Appendix A.

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*See Appendix B for School Classifications

Chapter 2

M.D. CAREER PERFORMANCE COMPARISONS: M.D. Postdoctorals and M.D. Non-Postdoctorals

M.D.'s who met the selection criteria (non-minority U.S. trained males first appointed to academic medicine in 1967 and whose entire employment experience has been full-time in academic medicine) are viewed with regard to certain indicators of academic performance in 1972. These performance indicators include:

(1) academic rank achieved by 1972;
(2) research orientation of medical school of employment in 1972;
(3) research as an area of responsibility in 1972;
(4) participation in Federally sponsored programs in 1972.

Those who received NIH-sponsored postdoctoral support before their first academic appointment are compared to those who had received no postdoctoral support as of 1972. A total of 76 M.D. postdoctorals and 71 M.D. non-postdoctorals met the selection criteria defined in Chapter 1.

Figure 1 shows the distribution across academic ranks in 1972 of the two groups of medical school faculty (M.D. postdoctorals and M.D. non-postdoctorals). Forty-one percent of the postdoctoral group achieved the rank of associate professor or higher, as compared to only 19 percent of the non-postdoctorals. A Kolmogorov-Smirnov Two-Sample Test[4] was run on the two distributions in order to determine if the observed differences could reasonably be expected to happen by chance. Results of the test indicated that the probability of obtaining differences at least as large as those observed through random sampling is only 3 percent. The observed differences are statistically significant, and therefore it can be concluded that given the experience controls defined by the selection criteria, the postdoctorals achieved higher academic ranks than the non-postdoctorals.

One possible explanation for this detected difference in academic rank achievement is the age of the employing institution. The postdoctorals may be concentrated in the newer schools where there is more chance for advancement. Figure 2 shows the distribution of the two groups according to the age of their employing schools in 1972. There is no difference between the two distributions using chi-square. Therefore, the M.D. postdoctorals do not achieve higher ranks because they are in newer schools.

As part of the NAS/NRC effort, a scale was developed which classified medical schools according to their research orientation [5] (See Appendix B).

Figure 1

Comparison of MD Postdoctorals and MD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Academic Rank Held in 1972

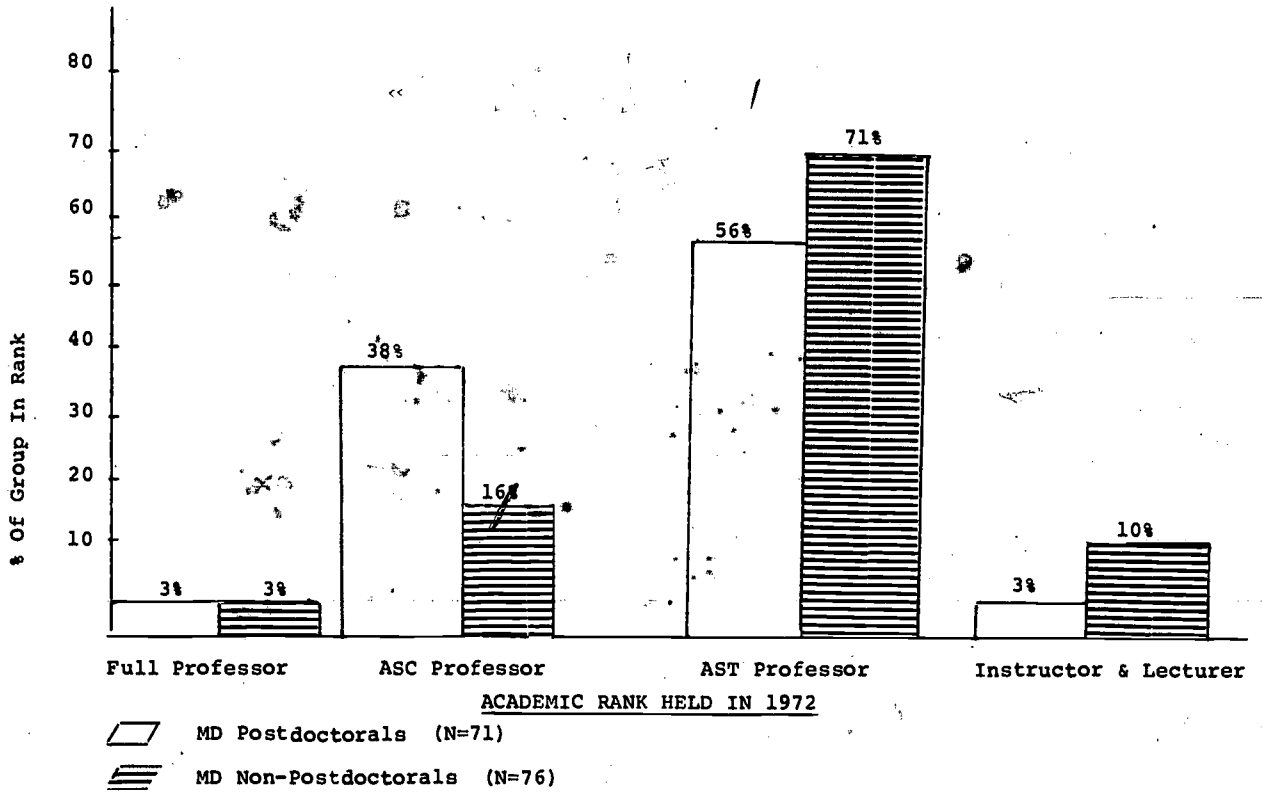


Figure 2

Comparison of MD Postdoctorals and MD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Age of Employing Medical School in 1972

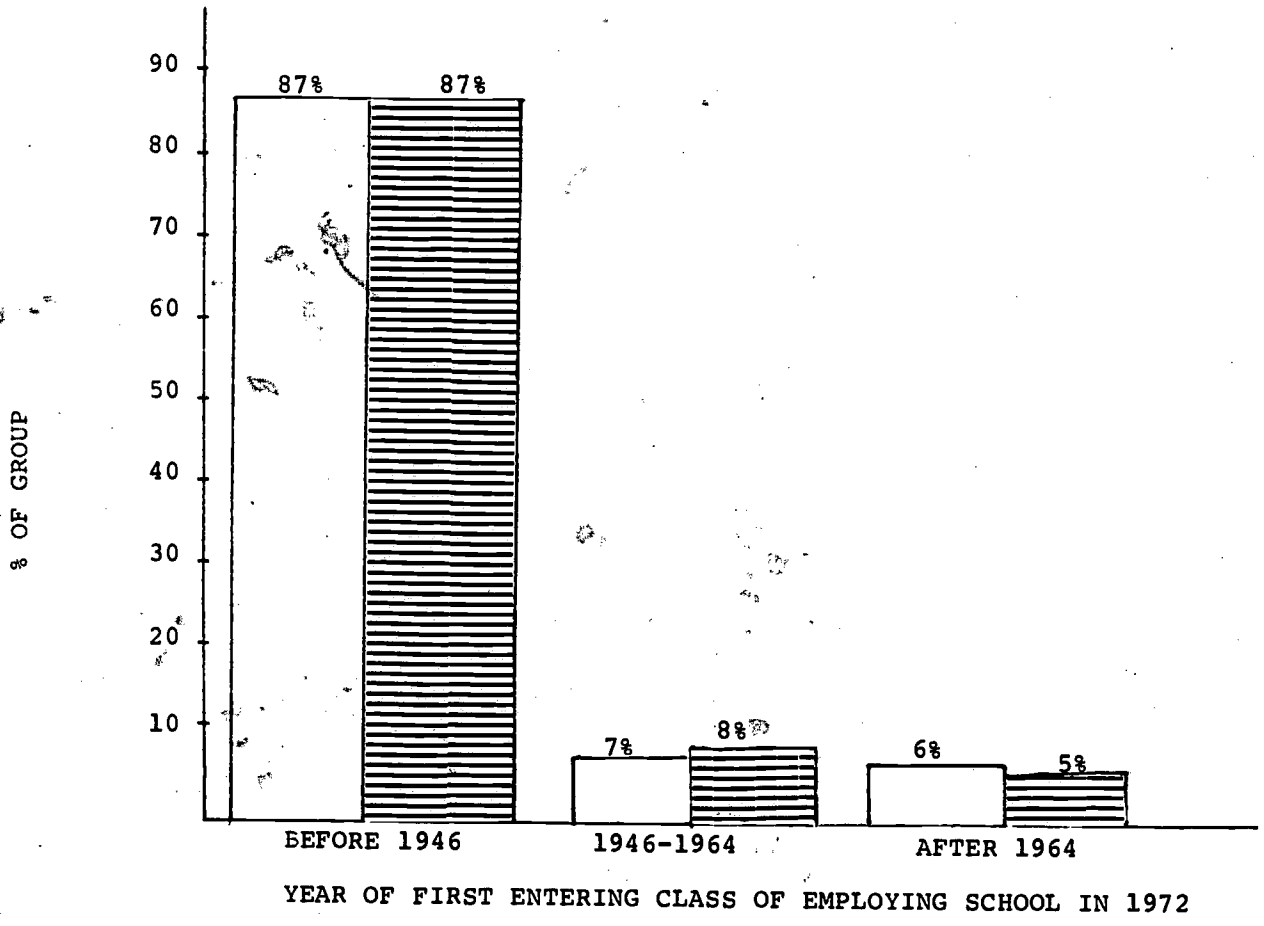


Figure 3 compares the M.D. postdoctorals to the M.D. non-postdoctorals according to the research orientation of the employing school in 1972, as measured by the NAS/NRC developed scale. Use of this scale in this research endeavor in no way implies official AAMC adoption of this scale. This particular scale was used only to foster comparison between the results of the two efforts.

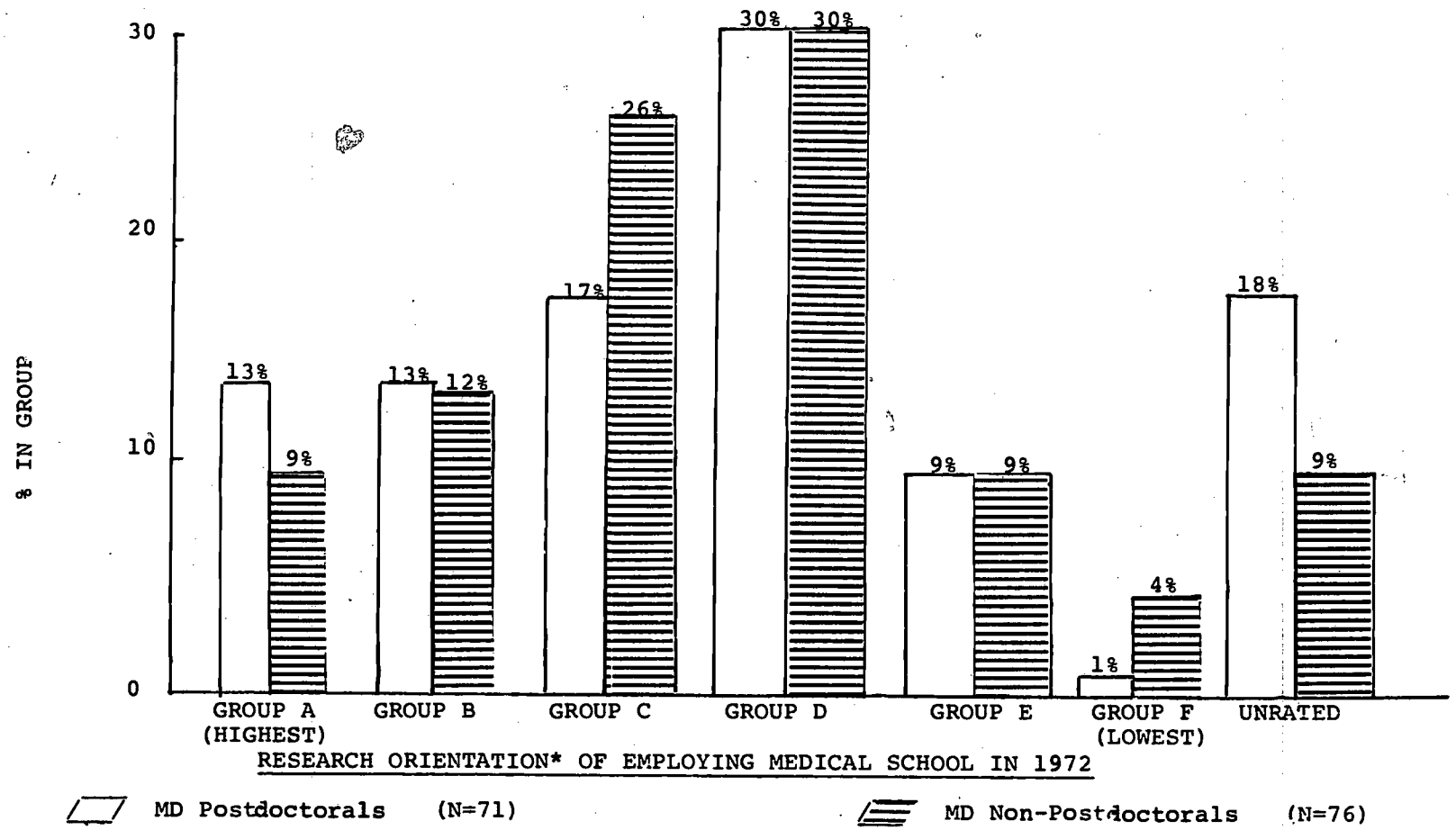
The results shown in Figure 3 indicate that there is a very slight tendency for the M.D. postdoctorals to be employed in the more research oriented schools. Twenty-six percent of the M.D. postdoctorals are employed in the top two research orientation categories (Groups A and B) as compared to only 21 percent of the M.D. non-postdoctorals although this difference is not statistically significant. When the Kolmogorov-Smirnov test was applied to these data, it was found that the observed differences could have easily been expected to happen through random sampling. Therefore, it cannot be concluded that the M.D. postdoctorals are more likely to be employed at the more research oriented schools than the M.D. non-postdoctorals.

Given that the NIH-sponsored postdoctoral training programs are intended to provide biomedical research training, it is reasonable to expect that proportionally more M.D. postdoctorals are doing research than are the M.D. non-postdoctorals. Figure 4 compares the two groups according to their major areas of responsibility in 1972. Eighty-two percent of the postdoctorals are engaged in research as compared to only 55 percent of the non-postdoctorals. A chi-square test was applied to this data, and the results indicated that the probability of obtaining a difference at least as great as the one observed is less than 1 percent. Therefore, it is concluded that proportionally more M.D. postdoctorals are engaged in research than are the M.D. non-postdoctorals.

How do both groups compare on their participation rates in Federal programs? Because postdoctorals are specifically trained in biomedical research, the expectation is that they participate in more Federal programs, especially research programs, than non-postdoctorals. The Faculty Profile Questionnaire for 1971-72 contained two questions regarding participation in Federal programs. One dealt with faculty participation in NIH Training Grants, and the other was concerned with faculty participation in "other Federal programs". These "other Federal programs" consist mainly of NIH research programs.[6]

Figure 3

Comparison of MD Postdoctorals and MD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Research Orientation* of Employing Medical School in 1972



* Research orientation scale developed by National Research Council
** Percents may not add due to rounding

Figure 4

Comparison of MD Postdoctorals and MD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Areas of Responsibility in 1972

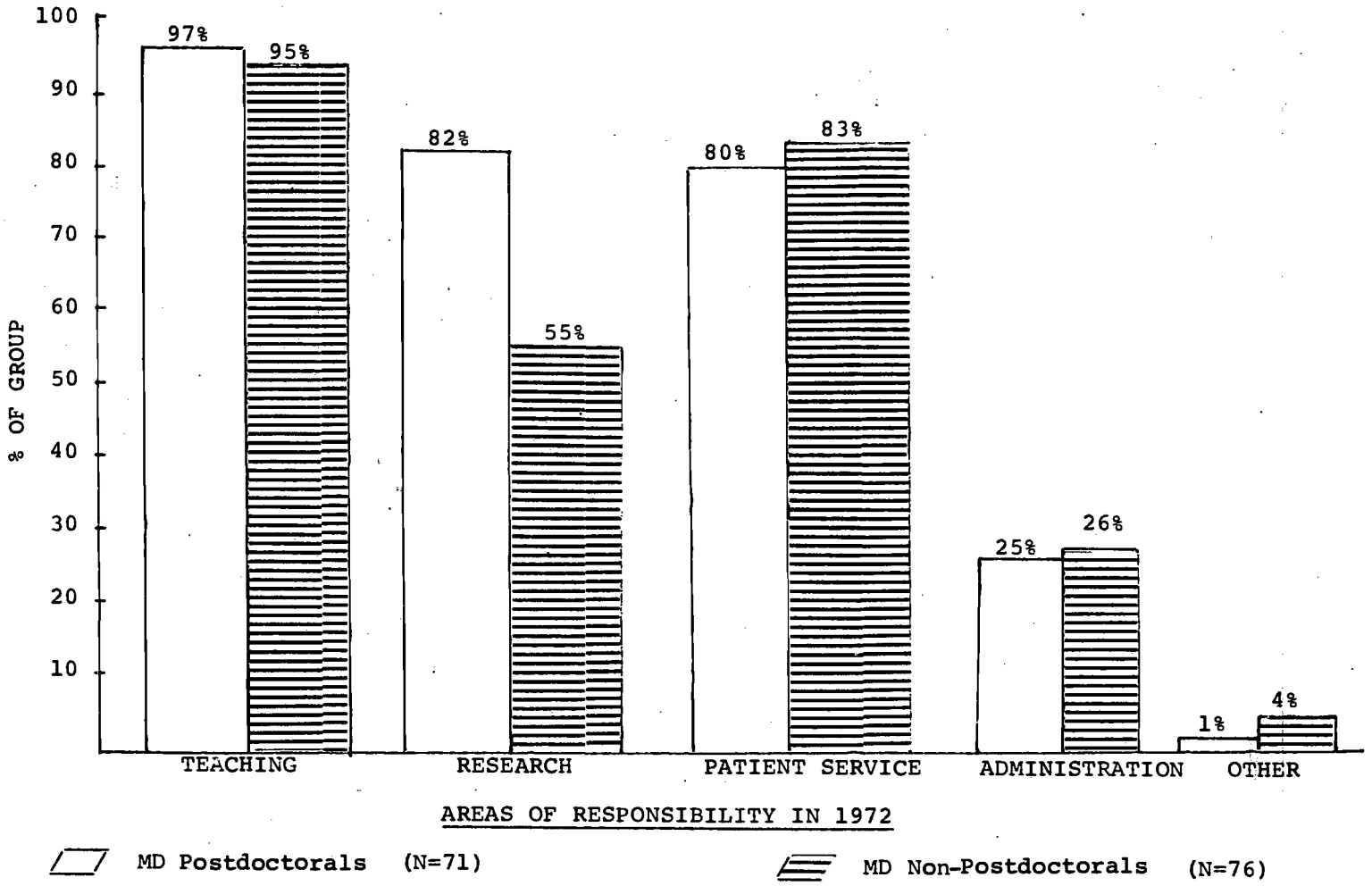


Figure 5 compares the two groups on participation in both NIH Training Grants and "other Federal programs." According to Figure 5, the M.D. postdoctoral participation in both types of programs is greater than that of the non-postdoctorals. Chi-square tests applied to these data indicated that observed differences in rates of participation in both NIH Training Grants and "other Federal programs" were statistically significant at the .01 level. Therefore, proportionally more M.D. postdoctorals participated in both training and research programs than did the non-postdoctorals.

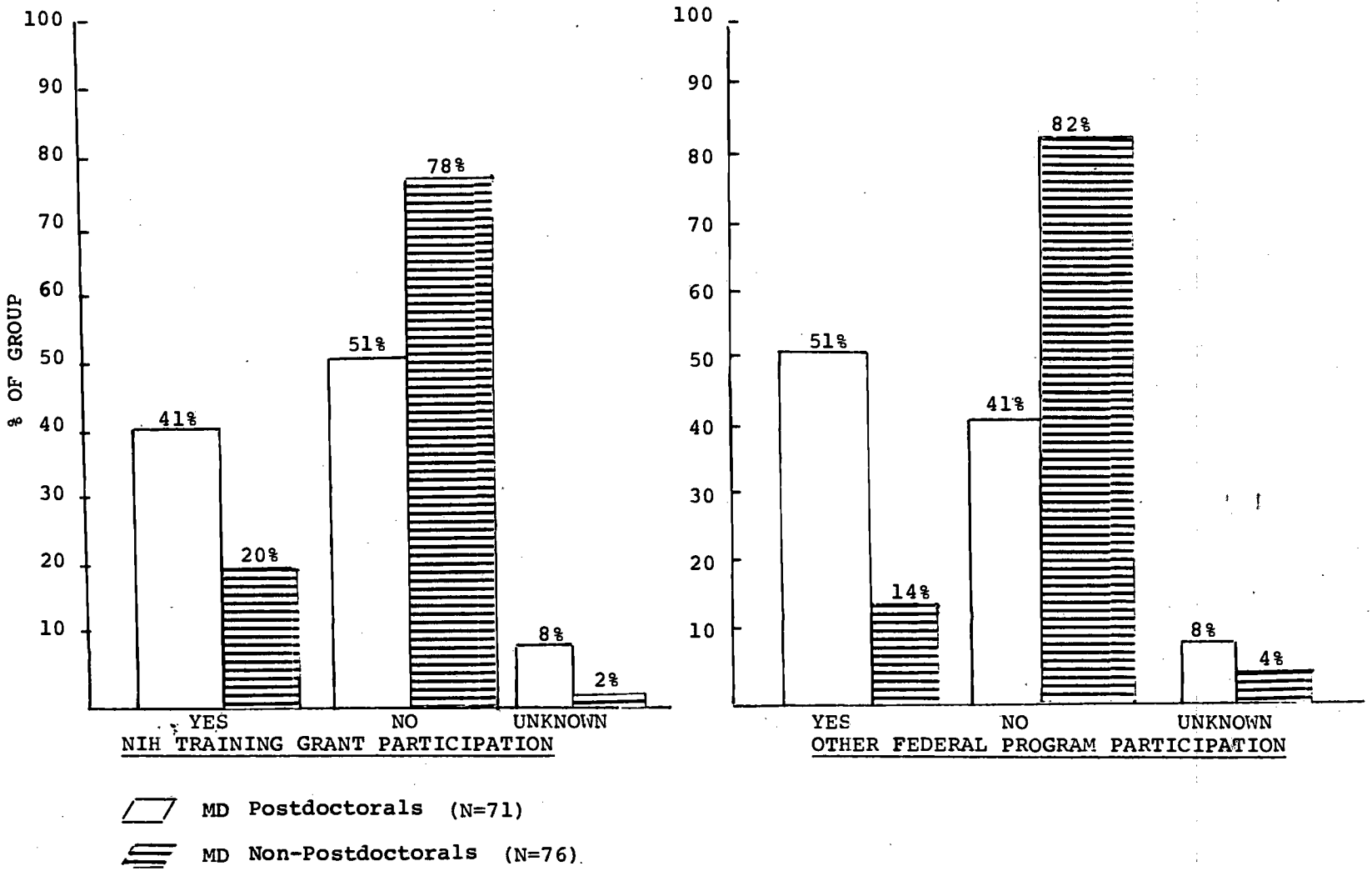
In summary, two samples of M.D. medical school faculty first appointed to academic medicine in 1967 were compared on selected academic performance criteria in 1972. One sample had completed postdoctoral training before their first appointment to academic medicine, the other sample had never had any postdoctoral training. The two groups were compared on specific performance criteria.

The results indicated that the M.D. postdoctorals outperformed the M.D. non-postdoctorals on all four career performance indicators. These differences were statistically significant for all indicators except the research orientation of the employing medical school in 1972. The following statistically significant differences in career achievement were observed:

(1) M.D. postdoctorals achieved higher academic ranks than did the M.D. non-postdoctorals, given the experience controls defined by the selection criteria;
(2) Proportionally more M.D. postdoctorals were engaged in research than were M.D. non-postdoctorals;
(3) Proportionally more M.D. postdoctorals participated in Federally sponsored training and research programs than did M.D. non-postdoctorals.

Figure 5

Comparison of MD Postdoctorals and MD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Participation in Federal Programs in 1972



Chapter 3

Ph.D. CAREER PERFORMANCE COMPARISONS: Ph.D. Postdoctorals and Ph.D. Non-Postdoctorals

In this chapter, Ph.D. postdoctorals who met the selection criteria defined in Chapter 1 are compared to Ph.D. non-postdoctorals who also met the selection criteria. The performance indicators used in this chapter are the same as those developed in Chapter 2. Thirty-seven postdoctoral Ph.D.'s and 48 non-postdoctoral Ph.D.'s met the selection criteria established in Chapter 1.

Figure 6 compares the two groups with respect to academic rank held in 1972. None of the Ph.D.'s in the study achieved the rank of full professor, but 30 percent of the postdoctorals achieved the rank of associate professor as compared to only 8 percent of the non-postdoctorals.

A Kolmogorov-Smirnov test was applied to the data to determine if the observed differences were statistically significant. The results of the test indicated that the differences were not statistically significant at the 5 percent level. However, the differences would have been significant at the 16 percent level. It is possible that had the sample sizes been slightly larger, the differences would have been significant at the 5 percent level.

Given the current samples dictated by the selection criteria, it is not possible to conclude that the Ph.D. postdoctorals achieve higher ranks than the Ph.D. non-postdoctorals, given the experience controls defined by the selection criteria.

Figure 7 graphically compares the two groups of Ph.D.'s according to the research orientation of employing medical schools. The research orientation scale used to make this comparison was developed by the National Research Council*. According to Figure 7, 11 percent of the Ph.D. postdoctorals are in the highest research orientation category, as opposed to none of the non-postdoctorals. In addition, 14 percent of the postdoctorals are in the second highest category, as compared to only 10 percent of the non-postdoctorals. A Kolmogorov-Smirnov test was applied to the data, and a significant difference was not found at the 5 percent level. The lack of statistical significance might again be the result of a small sample rather than to no real between-group difference in the performance indicator.

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* See Appendix B

Figure 6

Comparison of PhD Postdoctorals and PhD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Academic Rank Held in 1972

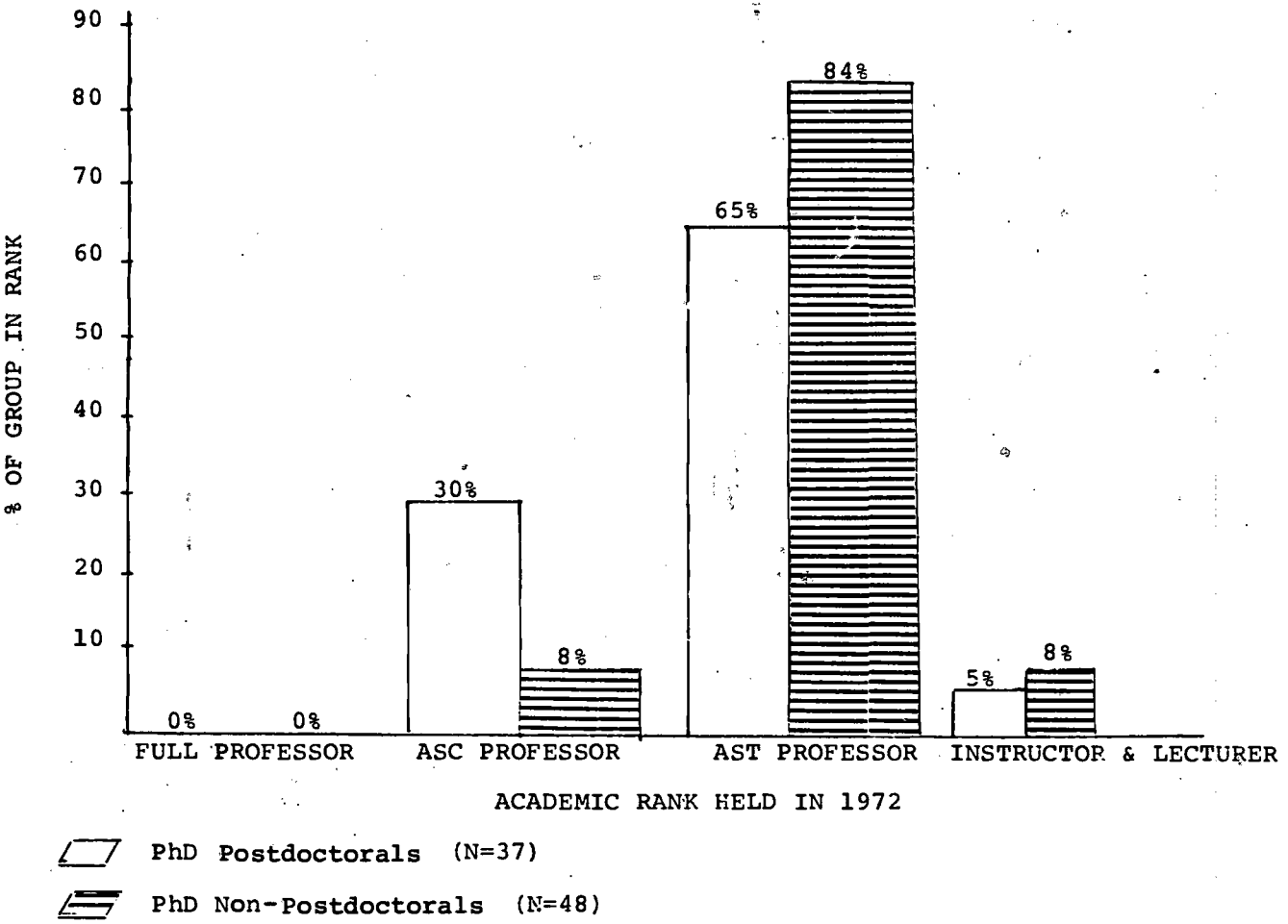
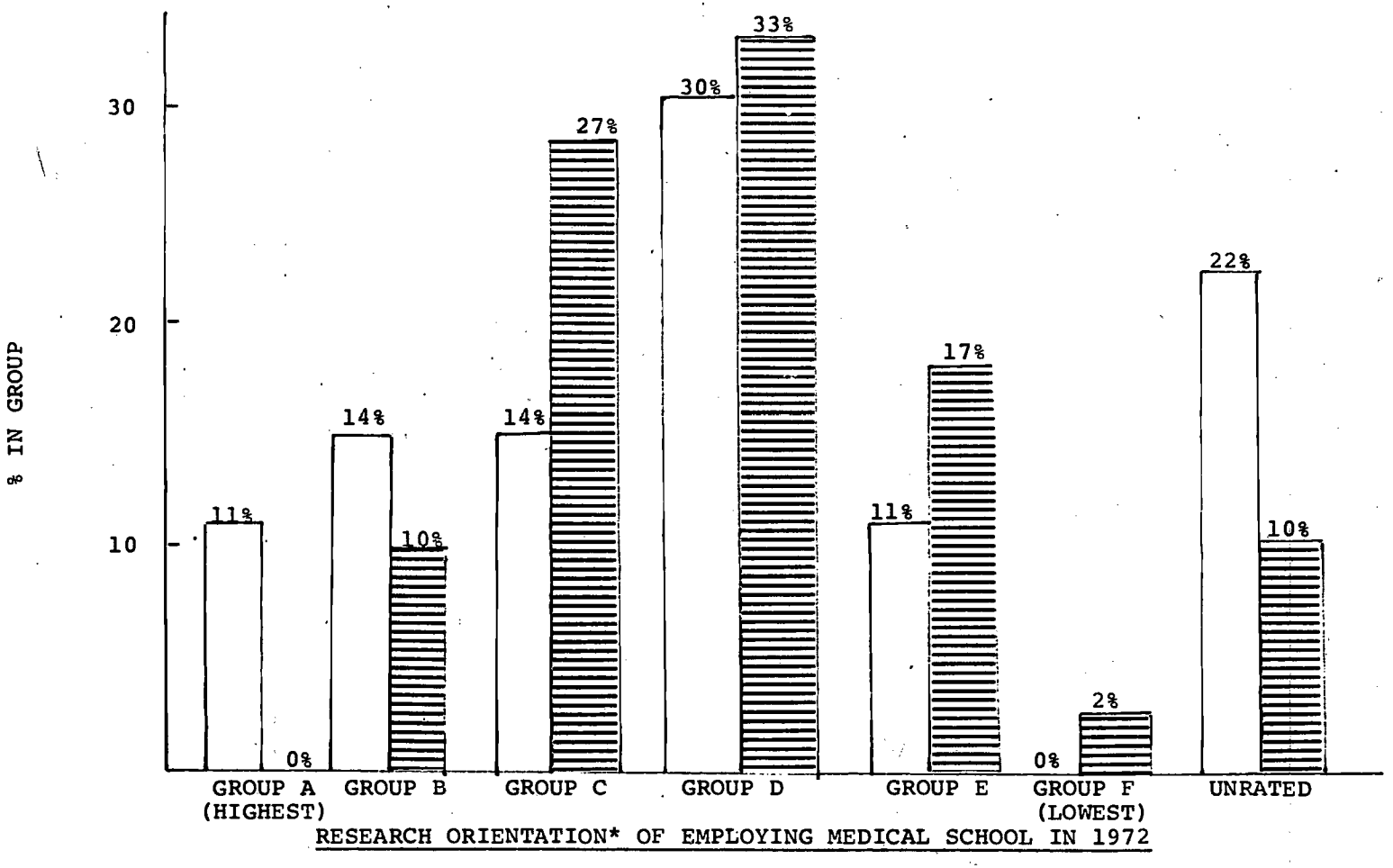


Figure 7

Comparison of PhD Postdoctorals and PhD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Research Orientation* of Employing Medical School in 1972



* Research orientation scale developed by National Research Council
** Percents may not add due to rounding

Figure 8 shows the two samples with respect to their areas of responsibility in 1972. One hundred percent of the Ph.D. postdoctorals are engaged in research as compared to only 79 percent of the Ph.D. non-postdoctorals. However, only 3 percent of the Ph.D. postdoctorals are involved in patient service, as opposed to 27 percent of the Ph.D. non-postdoctorals. Chi-squared tests showed both of these differences to be significant at the 5 percent level. Therefore, it is reasonable to draw the following two conclusions:

(1) Proportionally more Ph.D. postdoctorals are involved in biomedical research than are Ph.D. non-postdoctorals;
(2) Proportionally fewer Ph.D. postdoctorals are involved in patient service than are Ph.D. non-postdoctorals.

Figure 9 displays the two comparison groups according to their participation in both NIH training grants and "other Federal programs" in 1972. These "other Federal programs" consist mostly of research programs sponsored by NIH.[7] Figure 9 shows that 51 percent of the Ph.D. postdoctorals are participating in NIH training grants, as opposed to only 33 percent of the Ph.D. non-postdoctorals. With respect to "other Federal programs", 68 percent of the Ph.D. postdoctorals are participating, as compared to 31 percent of the Ph.D. non-postdoctorals. Both of these differences were found to be significant at the 5 percent level upon the application of chi-square tests. Therefore, it is reasonable to conclude that proportionally more Ph.D. postdoctorals are participating in Federally sponsored training and research programs than are Ph.D. non-postdoctorals.

In summary, two samples of Ph.D. medical school faculty first appointed to academic medicine in 1967 were compared on selected academic performance criteria in 1972. One sample completed postdoctoral training before 1968 and the other group never underwent postdoctoral training. The two samples were compared on the following performance criteria: (1) Academic rank achieved by 1972; (2) Research orientation of employing medical school in 1972; (3) Research as a major area of responsibility in 1972; (4) Participation in Federally sponsored training and research programs in 1972.

The results indicated that the Ph.D. postdoctorals outperformed the Ph.D. non-postdoctorals on all four career performance criteria. These differences were statistically significant for the last two criteria, and bordered on significance for the first two criteria. It was felt that a

Figure 8

Comparison of PhD Postdoctorals and PhD Non-Postdoctorals First Appointed to Academic Medicine in 1967 By Areas of Responsibility in 1972

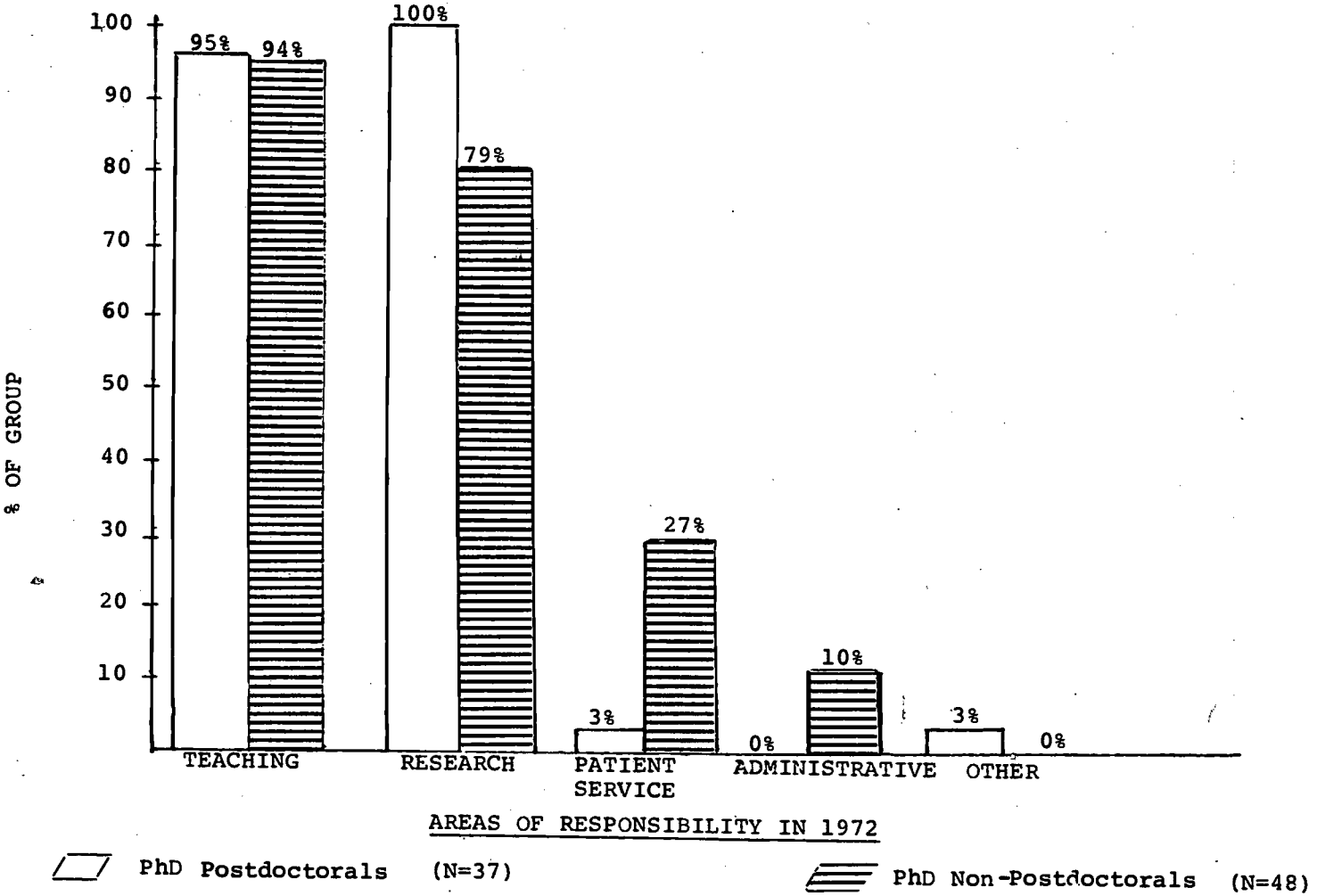
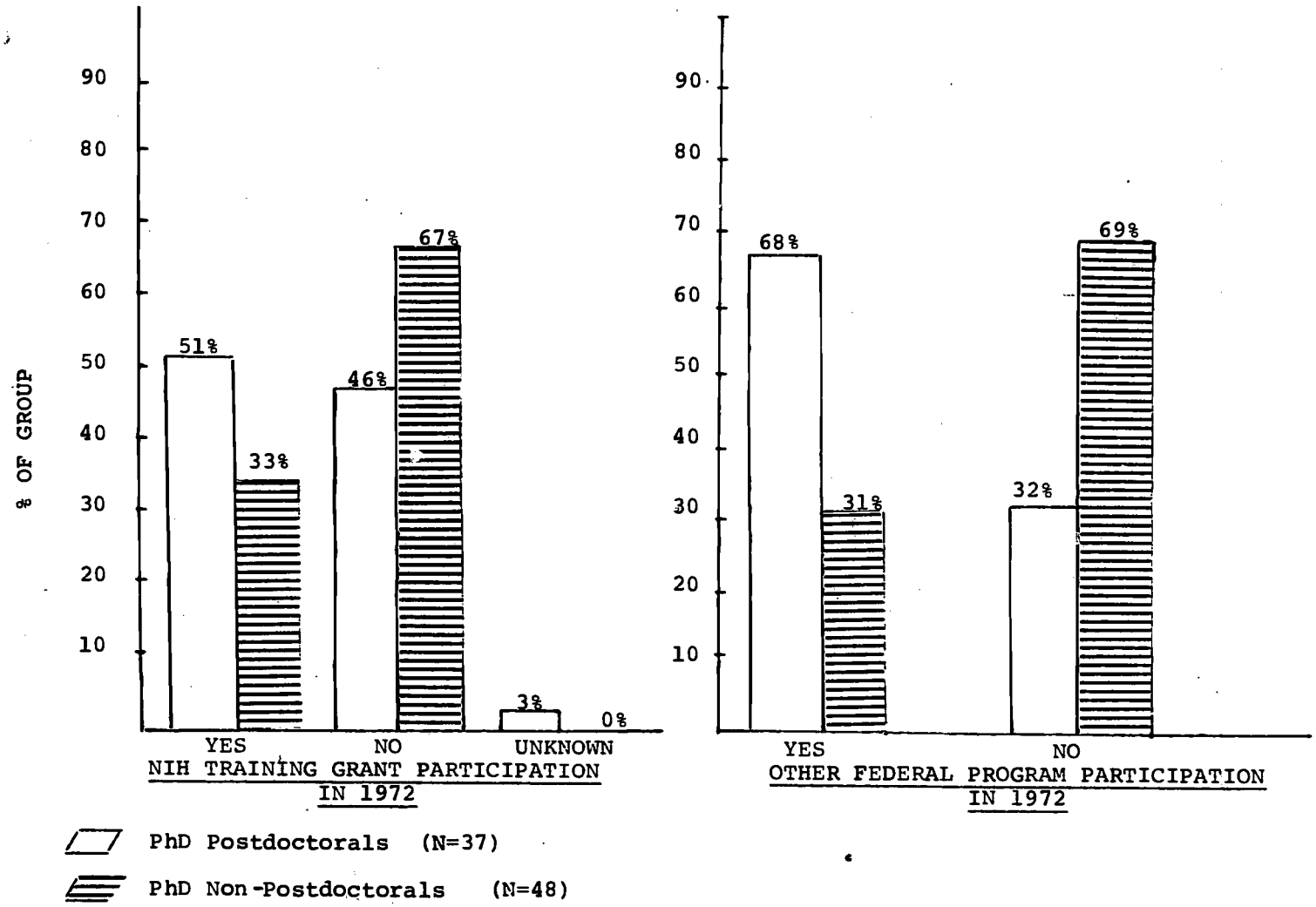


Figure 9

Comparison of PhD Postdoctorals and PhD Non-Postdoctorals
First Appointed to Academic Medicine in 1967 By
Participation in Federal Programs in 1972



marginal increase in sample size may have generated statistically significant results on the first two criteria. However, given the samples defined by the selection criteria, the following conclusions were drawn:

(1) Proportionally more Ph.D. postdoctorals were engaged in research than were Ph.D. non-postdoctorals;
(2) Proportionally more Ph.D. postdoctorals were participating in Federally sponsored training and research programs than were Ph.D. non-postdoctorals.

Chapter 4

SUMMARY AND CONCLUSIONS

In Chapter 2, a sample of medical school faculty who had undergone NIH-supported postdoctoral training was compared, using selected academic performance criteria, to a sample of medical school faculty who had never undergone any postdoctoral training. Both samples were limited to non-minority males who earned their M.D.'s in U.S. medical schools. Furthermore, both samples were limited to persons first appointed to academic medicine in 1967 whose entire employment experience had been full-time in academic medicine and who were still employed in academic medicine in 1972. The two groups were compared on the following four academic performance indicators:

(1) academic rank achieved by 1972;
(2) research orientation of employing medical school in 1972;
(3) research as an area of responsibility in 1972;
(4) participation in Federally sponsored research and training programs in 1972.

The M.D. postdoctorals outscored the M.D. non-postdoctorals on all four performance criteria. The score differences were found to be statistically significant for all but the second criterion. Therefore, it was concluded that:

(1) M.D. postdoctorals achieved higher academic ranks than their colleagues without postdoctoral training.
(2) Proportionally more M.D. postdoctorals were engaged in research than were M.D. non-postdoctorals.
(3) Proportionally more M.D. postdoctorals participated in Federally sponsored training and research programs than did M.D. non-postdoctorals.

In Chapter 3, a similar analysis was performed for Ph.D.'s in academic medicine. The sample selection criteria and the academic performance criteria were the same as those in Chapter 2. However, since there were roughly twice as many M.D.'s in academic medicine as there are Ph.D.'s, sample sizes for the Ph.D. groups were roughly half of the sample sizes for the two M.D. groups. Therefore, in order to meet tests of statistical significance, differences between Ph.D. postdoctorals and Ph.D. non-postdoctorals on any performance criterion had to be quite pronounced. Initially, it appeared that the Ph.D. postdoctorals outscored the Ph.D. non-postdoctorals on all four academic performance criteria. However, only two of these differences were statistically significant at the 5 percent level. Therefore, the following two conclusions were drawn:

(1) Proportionally more Ph.D. postdoctorals were engaged in research than were Ph.D. non-postdoctorals.

(2) Proportionally more Ph.D. postdoctorals were participating in Federally sponsored training and research programs than were Ph.D. non-postdoctorals.

Recommendations for Future Research

The research methodology developed in this paper was intended to shed some light on the question of career performance differentials within academic medicine between persons who have undergone postdoctoral training and those who have not. The attempt was made to design the research methodology in such a way that any significant differences in the academic performance criteria could be attributed to the presence or absence of postdoctoral training. However, at the present time, it is premature to draw that conclusion.

Although it was found that a sample of postdoctorals in academic medicine generally outperformed their colleagues who had not undergone such training, it cannot be concluded that these differences are totally attributable to postdoctoral training. Because the selection processes for postdoctoral trainees and fellows are highly competitive, it is assumed that positions are filled with those candidates who exhibit the most promise.

It is possible that had the samples of postdoctorals and non-postdoctorals been viewed prior to selection for postdoctoral training, the postdoctorals would still have outperformed the non-postdoctorals on such indicators as research orientation of school of graduation or cumulative grade point average. Therefore, in order to increase confidence in the findings of the current research effort, it is necessary to redesign the selection criteria in such a way as to control for performance before the postdoctoral appointment. Because such a change would undoubtedly reduce the number of people in each subsample to the point of statistical unreliability, it is necessary to relax some of the other selection criteria. Perhaps the samples should include faculty who were appointed in years other than 1967. As long as proportionality is maintained between control and treatment groups with regard to year of first appointment to academic medicine, any inferences drawn from comparison of the two groups on performance criteria should be fairly reliable.

In addition, it may be necessary to control for field of specialization for both M.D.'s and Ph.D.'s. No attempt was made to do this in the current effort. It may also be desirable to expand the performance criteria used in the current effort. All data used for this study was limited to that which was extractable from the Faculty Profile System, but this system maintains no information on publications. Perhaps future efforts should incorporate some measure of publication output.

In general then, steps may be taken to redefine the selection criteria in such a way as to make the performance comparisons more meaningful. Also, it may be possible to incorporate additional performance measures into the research design. Although it is not possible to conclude that exposure to postdoctoral training results in better career performance in academic medicine, it is certainly not possible to reject that notion.

FOOTNOTES

[1]Biomedical Research Manpower - Report of the Conference held October 1-3, 1973 at the Battelle Research Center, Seattle, Washington. Sponsored by the Council of Academic Societies of the Association of American Medical Colleges. May 1974, Washington, D.C., p.38.

[2]The Training Programs of the Institutes of the National Institutes of Health Fiscal Year 1974 Volume 1. Office of the Director National Institutes of Health U.S. Department of Health, Education and Welfare, October 1972. Washington, D.C. p.1.

[3]Postdoctoral Training in the Biomedical Sciences: An Evaluation of NIGMS Postdoctoral Traineeship and Fellowship Programs. National Academy of Sciences/ National Research Council. Washington, D.C. June 1973.

[4]Siegal, Sidney, Nonparametric Statistics, McGraw-Hill Book Company, New York, 1956 (pp. 127-136).

[5]Postdoctoral Training in the Biomedical Sciences, pp. 107-108.

[6]Fribush and Larson, Medical School Characteristics Associated With Faculty Participation in Federal Programs. AAMC, 1974, p. 2.

[7]Fribush and Larson, p.2.

APPENDICES

APPENDIX A

Faculty Profile Questionnaire

DATE OF FORM 1. COMPLETION ____/____/____ Mo. Day Yr.

SALARIED MEDICAL FACULTY QUESTIONNAIRE

(Faculty Profile - New Accession Form)

AAMC Form FP-1
Rev, 9/73

MEDICAL SCHOOL OF CURRENT EMPLOYMENT _____

NAME _____ (Surname) (First) (Middle Initial or Name) 2. SEX ☐ Male ☐ Female 3. SOC. SEC. No. ____/____/____

4. BIRTHDATE ____/____/____ Mo. Day Yr. 5. BIRTHPLACE _____ (Country) 6. CURRENT CITIZENSHIP _____ (Country)

7. FORMER CITIZENSHIP (If U.S. Naturalized) _____
(If U.S. Citizen by Birth, Enter "NA" - Not Applicable)

8. DATE OF U.S. NATURALIZATION ____/____/____ Mo. Day Yr.

9. VISA STATUS: (If Currently an Alien)
☐ TEMPORARY
☐ PERMANENT

76. OPTIONAL INFORMATION
(For school use only)

75. ETHNIC GROUP
Because of interest and concern regarding employment opportunities for ethnic minorities, you are requested to indicate below in which ethnic group you consider yourself. (Check One)

☐ 1-Black American
☐ 2-American Indian
☐ 3-Mexican American
☐ 4-Puerto Rican
☐ 5-Other Spanish Surnamed
☐ 6-Oriental (Chinese or Japanese)
☐ 7-Other Asian
☐ 8-Caucasian
☐ 9-Other
☐ 0-Do Not Wish To Respond

CURRENT APPOINTMENT DATA:

10. MEDICAL SCHOOL DEPARTMENT _____
(Or Administrative Unit Equal to or Above Dept. Level)

11. ACADEMIC RANK _____

12. ADMINISTRATIVE TITLE _____
(If No Title, Enter "NONE")

13. JOINT DEPARTMENT _____
(If No Joint Dept., Enter "NONE")

14. JOINT DEPT. ACADEMIC RANK _____

15. JOINT DEPT. ADMINISTRATIVE TITLE _____
(If No Title, Enter "NONE")

CHECK ONE OF THE BOXES BELOW, INDICATING THE JOINT DEPARTMENT'S "LOCATION"

☐ MS - Medical school
☐ HS - Other health profession school within the university
☐ OD - Other division of the university
☐ OI - Other institution, e.g., another institution of higher education or an affiliated hospital

16. SPECIALTY OR DISCIPLINE: Enter below the specialty(s) or discipline (s) from the Specialty/Discipline List which best describe(s) your current activities.

NAME (Surname) (First) (Middle Initial or Name) DEPARTMENT _____

16. _____ 16A. _____

17. MAJOR AREAS OF RESPONSIBILITY: Should indicate major functional emphasis of activity in any combination of Teaching, Research, Patient Care, Administration, or Other. Check all that apply. If a primary responsibility exists, enter the letter "P" in appropriate box. Primary responsibility should reflect predominant area of activity in which major effort is directed over and above other areas of major activity, when appropriate.

☐ TEACHING
☐ RESEARCH
☐ PATIENT CARE
☐ ADMINISTRATION
☐ OTHER

18. NATURE OF EMPLOYMENT: (Check one)

☐ SFT	Strict full-time in medical school	☐ SFTA	Strict full-time in affiliated institution*
☐ GFT	Geographic full-time in medical school	☐ GFTA	Geographic full-time in affiliated institution*
☐ PTS	Part-time salaried in medical school	☐ PTSA	Part-time salaried in affiliated institution*
☐ NS	Non-salaried		* (Usually teaching hospitals)

18A. If Nature of Employment is SFTA, GFTA, or PTSA (See Item 18) enter name of affiliated institution _____

19A. Beginning Month and Year of current employment as a salaried faculty member at this school _____

26. From which of the following sources did you ORIGINALLY enter U.S. Medical School Salaried Academic Employment? (Check only one)

PROFESSIONAL TRAINING:

40 ☐ U.S. Medical School
42 ☐ Other U.S. Educational Institution
44 ☐ Internship or Residency
46 ☐ NIH Training Program
47 ☐ NIMH Training Program
48 ☐ Other Training Program
50 ☐ Foreign Educational Institution

PROFESSIONAL EMPLOYMENT:

10 ☐ Volunteer Faculty - This Medical School
11 ☐ Volunteer Faculty - Other U.S. Medical School
12 ☐ Other U.S. Educational Institution
14 ☐ Foreign - Academic
16 ☐ Foreign - Non-Academic
18 ☐ Private Practice of Medicine
19 ☐ U.S. Active Military Service
20 ☐ U.S. Govt. - DOD & Military Hosps.
22 ☐ U.S. Govt. – PHS (Include PHS Hosps. NIH & NIMH)
24 ☐ U.S. Govt. –Veterans Admin. (Include VA Hosps.)
26 ☐ U.S. Govt. – Other
28 ☐ U.S. Hospital (Non-Federal)
30 ☐ Foundation (or Research Institute)
34 ☐ State or Local Govt. (U.S.)
36 ☐ Private Business or Industry
98 ☐ Other (Specify) _____

PAST PROFESSIONAL EMPLOYMENT HISTORY:

	YEARS From (a)	YEARS To (b)	TYPE OF EMPLOYMENT (If Academic, Enter School Name and Location) (If Non-Academic, Enter From Above Professional Employment List) (c)	MAJOR AREAS OF RESPONSIBILITY (d) TEACHING	RESEARCH	PATIENT CARE	ADMIN.	OTHER	COMPLETE COLUMNS (e)-(h) FOR MEDICAL SCHOOL EMPLOYMENT ONLY: DEPARTMENT (e)	NATURE OF EMPLOYMENT (f)	ACADEMIC RANK (g)	ADMINISTRATIVE TITLE (h)
20												
21												
22												
23												
24												
25												

26A. YEAR OF YOUR FIRST U.S. MEDICAL SCHOOL SALARIED FACULTY APPOINTMENT _____

27. HAVE YOU EVER SERVED AS A VOLUNTEER NON-SALARIED FACULTY MEMBER AT A U.S. MEDICAL SCHOOL? YES ☐ NO ☐ 28. LATEST YEAR _____

EARNED DEGREES:

LIST ALL EARNED DEGREES AT THE BACHELOR'S LEVEL AND ABOVE. (Two degrees at the same level may not be entered on the same line. In such cases, enter the more recent.)

29. IF NO EARNED DEGREES, PLEASE CHECK ☐

		SPECIFY DEGREE (a)	FIELD OF STUDY (Select from Specialty/Discipline List) (b)	INSTITUTION CONFERRING DEGREE (c)	STATE (If U.S.) COUNTRY (If Foreign)	YEAR COMPLETED (d)
M.D., D.D., OR FOREIGN EQUIVALENT	30		MEDICINE			
PH.D OR EQUIVALENT	31					
OTHER HEALTH RELATED DOCTORATE	32					
MASTERS	33					
BACHELORS	34					

ITEMS 36-54 TO BE COMPLETED BY M.D.'S, O.O.'S OR FOREIGN EQUIVALENT ONLY

INTERNSHIPS IN THE U.S.A.		HOSPITAL (a)	CITY	STATE	YEAR COMPLETED (b)
36 NONE ☐	37				
	38				

RESIDENCIES IN THE U.S.A.		HOSPITAL (a)	CITY	STATE	RESIDENCY PROGRAM (b)	YEAR COMPLETED (c)
39 NONE ☐	40					
	41					
	42					
	43					

U.S. MEDICAL SPECIALTY BOARD CERTIFICATION: 45 NONE ☐

46 FIRST CERTIFICATION _____ 47 YEAR _____ 48 SECOND CERTIFICATION _____ 49 YEAR _____

FOREIGN MEDICAL SPECIALTY CERTIFICATION: 52 NONE ☐ 53 SPECIALTY _____ 54 YEAR _____

PRE- AND POSTDOCTORAL SUPPORT:

(Select responses for Purpose and Source of Award from the lists below)

PURPOSE

01 Complete Degree *
08 Complete Additional Doctorate*
03 Specialty Training
02 Training Only
04 Teaching Only
05 Research Only
06 Training & Research
07 Teaching & Research
09 Training & Teaching
11 Training, Teaching, & Research

*Use for Predoctoral only.

SOURCE OF AWARD

Abbreviations		Abbreviations	
11 NIH	National Institutes of Health	24 NSF	National Science Foundation
12 PHS	Other Public Health Service	23 VA	Veterans Administration
15 CPEHS	Consumer Protection & Environmental Health Service	25 FED-Other	Federal-Other
		46 ACAD	Academic
14 HSMHA	Health Services & Mental Health Admin. (incl. NIMH)	45 ACAD-F	Academic Foreign
16 SRS	Social Rehabilitation Service	35 FOR	Foreign
17 SSA	Social Security Admin.	38 FDN	Foundation, society, association
18 OE	Office of Education	37 IND	Industry, business
13 DHEW-Other	All other-Dept. Health, Education & Welfare	90	All Other, please specify

PREDOCTORAL SUPPORT (LIST SUPPORT FOR SIX MONTHS DURATION OR LONGER)

55 NONE ☐	INSTITUTION OF TRAINING (a)	DISCIPLINE (Select from Specialty/Discipline List) (b)	PURPOSE (c)	SOURCE OF AWARD (d)	Years From (e)	Years To (f)
56						
57						
58						

POSTDOCTORAL SUPPORT (LIST SUPPORT FOR SIX MONTHS DURATION OR LONGER)

59 NONE ☐	INSTITUTION OF TRAINING (a)	DISCIPLINE (Select from Specialty/Discipline List) (b)	PURPOSE (c)	SOURCE OF AWARD (d)	Years From (e)	Years To (f)
60						
61						
62						
63						

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) Teaching	Research	Patient Care	Other	NAME OF SPONSORING AGENCY'S PROGRAM (c)	Salary Support Yes (d)	Salary Support 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

NAS/NRC Research Orientation Scale for U.S. Medical Schools

Group A; Score = 6

Harvard, Chicago, Johns Hopkins, Yale, Columbia

Group B; Score = 5

Cornell, Rochester, Washington University (St. Louis), New York University, Vanderbilt, Duke, University of Pennsylvania, Case-Western Reserve, Stanford

Group C; Score = 4

University of Virginia, Emory, Boston University, State University of New York at Syracuse, Wisconsin, Minnesota, Michigan, George Washington University, University of California at San Francisco, State University of New York at Brooklyn, Northwestern, State University of New York at Buffalo, University of Washington (Seattle), Tulane, Vermont, University of California at Los Angeles, University of Utah, University of Cincinnati, Einstein-Yeshiva

Group D; Score = 3

University of Illinois, University of Iowa, Temple, Gray-Wake Forest, University of Southern California, Tufts, St. Louis University, University of Maryland, Baylor, University of Oregon, Georgetown, Pittsburgh, Albany Medical Union, Jefferson Medical College, University of Colorado, Medical College of Virginia, New York Medical College, University of Kansas, Marquette, University of Nebraska, University of Texas, Wayne State University, Ohio State University, University of Oklahoma, Medical College of South Carolina, Women's Medical College (Pa.)

Group E; Score = 2

Indiana University, University of Louisville, University of Arkansas, Loyola, University of Puerto Rico, Hahnemann Medical College, Louisiana State University, Creighton University, University of Tennessee, Chicago Medical School, University of Southwest Texas, University of Alabama, University of Mississippi

Group F; Score = 1

Medical College of Georgia, University of Missouri, Loma Linda University, Howard University, Meharry Medical College

Unrated Schools

University of Arizona, University of California - Davis, University of California - San Diego, University of Connecticut,

Florida State School of Medicine, University of Florida, University of Miami, University of South Florida, Southern Illinois University, Rush Medical College, University of Kentucky, University of Massachusetts, University of North Carolina, University of North Dakota, University of South Dakota, West Virginia University, Dartmouth Medical School, University of Nevada School of Medicine, College of Medicine and Dentistry of New Jersey - Newark, College of Medicine and Dentistry of New Jersey - Rutgers, University of New Mexico, State University of New York at Stony Brook, Mount Sinai, Medical College of Ohio - Toledo, Texas Technological University - Lubbock, University of Texas Medical Branch - Galveston, University of Texas Medical School - Houston, Eastern Virginia Medical School .

APPENDIX C

Definitions

1) Postdoctoral support - Postdoctoral training support follows one or more doctoral degrees and reflects training not directed toward obtaining a degree.

2) Postdoctoral trainees - postdoctorals who are receiving support from NIH training grants. Such grants are allocated to the academic departments of institutions and the institutions then determine who is to be trained.

3) Postdoctoral fellows - postdoctorals who have received fellowships. These fellowships are allocated by the granting agency to individuals through national competition.

4) Full-time status - those persons who perform all their professional activity under the auspices of the medical school or its affiliated institutions.

5) Academic medicine - faculty appointments at a U.S. medical school.

6) Non-minority status - excludes Black American, American Indian, Mexican-American, and Puerto Ricans not living in Puerto Rico.

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