

Chapter 4

Early Career Outcomes of NRSA Predoctoral Training in the Behavioral Sciences

This chapter profiles the early career outcomes of former NRSA predoctoral trainees and fellows in the behavioral sciences. It represents the first formal assessment of this group in nearly two decades. Although some limited tracking of behavioral sciences trainees and fellows has been conducted (e.g., Alcohol, Drug Abuse, and Mental Health Administration, 1986; Clouet, 1986; National Research Council, 1977; Schneider, 1980), such efforts have seldom examined multiple outcomes or incorporated comparison groups into their methodologies. This also is true of the recent report issued by the Center for the Advancement of Health (1999) in which its conclusions about the targeting and quality of NRSA research training stemmed from interviews with a small number of trainees, fellows, and faculty advisors.

In the following sections, a more comprehensive picture is provided by examining multiple outcomes that identify the extent to which former NRSA predoctoral awardees have established research careers. These outcomes are then compared to those of both Ph.D.s who graduated from the same departments but who did not receive NRSA training support and those from departments with no NIH predoctoral training grants. Similar to the analyses for the biomedical sciences that were reported in Chapter 3, outcomes of interest include: (1) completion time for the doctorate; (2) immediate plans after completing the degree; (3) research-related employment in academic and nonacademic settings; (4) application and success rates for NIH and NSF research grants; and (5) publication activity. However, due to the much smaller share of NIH funds that have been awarded for behavioral sciences research training, the available outcome data that were provided from sample surveys resulted in small sample sizes, which limited both the precision of the estimates for individual cohorts and the ability to detect meaningful group differences.

As described in Chapter 1, individuals in clinical, counseling, and school psychology, speech pathology, and the hearing sciences were not part of the assessment. This was a function of the difficulties associated with constructing appropriate comparison groups, given the strong clinical training component and career options in these fields. For example, clinical, counseling, and school psychology have experienced strong growth in terms of doctoral production until 1993 (Howard et al., 1986; National Science Foundation, 2000; Pion & Lipsey, 1984). Although many Ph.D.s graduated from programs that incorporated both research and clinical training, an increasing number earned their degrees from programs focused primarily on training practitioners (i.e., professional schools of psychology). These doctoral programs differ in several ways related to the extent and quality of research training; their faculties publish less, research grants are less frequent, and less emphasis is placed on becoming independent investigators (Maher, 1999). In addition, most clinical, counseling, and school psychologists, regardless of where their training occurred, have pursued full-time careers as practitioners. Because a large fraction of new doctorates is in these fields but few NRSA predoctoral training awards, these fields were significantly overrepresented in the comparison groups. Whereas clinical, counseling, and psychology accounted for 11 percent of NRSA trainees and fellows, they comprised 37 and 51 percent of Ph.D.s who did not receive such support.¹ This introduced the distinct possibility that any observed differences in research careers between the NRSA study and comparison groups were primarily due to the different career paths and opportunities available for service providers versus researchers. A similar situation occurred with regard to the speech and hearing sciences. Consequently, the analyses focused on doctorates in

¹Moreover, a healthy portion of comparison group members in these fields graduated from professional schools of psychology (12 percent), and their career choices leaned more toward clinical service than research.

anthropology, sociology, and the nonclinical areas of psychology (e.g., developmental, experimental, physiological, and social psychology).²

Time Required to Complete the Doctorate

As discussed in Chapter 3, completing the doctorate in less time can be viewed as a positive event. Although longer completion times are not synonymous with poor quality training, spending more time in graduate school can involve a greater investment of both time and financial resources by students and programs relative to the number of Ph.D.s awarded (Bowen & Rudenstine, 1992). It also may reflect the negative aspects of teaching assistantships, research assistantships, and additional part-time jobs, all of which may impose demands that delay progress toward the degree. Compared to the biomedical sciences, these problems may be more prevalent in the behavioral sciences, where large undergraduate classes require the use of teaching assistants. Also, a significant fraction of graduate students in these fields (27 percent) relies on other jobs to finance their doctoral study. The provision of NRSA stipend and tuition assistance could partly resolve these difficulties by allowing trainees and fellows the freedom to pursue their studies full-time, unencumbered by non-degree-related work responsibilities.

During the 1980s, larger increases in completion times occurred in the behavioral sciences as compared to many other scientific disciplines (Syverson, 1982; Thurgood & Clarke, 1995). Whereas the average registered time-to-degree (RTD) for 1981-82 behavioral science doctorates was 7.4 years, it was 8.0 years for those earning Ph.D.s in 1991-92. Graduates from psychology programs did, however, tend to complete their degrees in noticeably less time than doctorates in sociology and anthropology (means of 7.5 versus 8.9, respectively).

At the same time, NRSA predoctoral trainees and fellows earned their Ph.D.s in slightly less time than either their fellow students from the same departments or those who earned their degrees from programs without NRSA training support (see Figure 4.1). Across all cohorts, former NRSA trainees and fellows completed their degree, on average, in 7.3 years. For the NIH and non-NIH training institution groups, the means were 8.2 and 8.0 years, respectively. Although time-to-degree crept up steadily in all three groups, individuals receiving NRSA predoctoral support typically spent nearly a year less working on their degree.

As Figure 4.1 also illustrates, these shorter completion times for trainees and fellows were not restricted to one discipline. In psychology, those with NRSA-supported predoctoral training earned their doctorate, on average, eight months sooner than did the graduate students in both comparison groups. Individuals supported by NRSA predoctoral training funds in sociology and anthropology programs spent, on average, about ten months less in graduate school than their fellow students from the same programs and eight months less than those from departments with no NIH predoctoral training support.

²For 1981-92 Ph.D.s who received nine or more months of NRSA predoctoral support, approximately 1 percent were in the speech and hearing sciences. Those in clinical, counseling, and school psychology accounted for a larger proportion (11 percent overall), but the numbers in each two-year cohort still were relatively small, ranging from 24 of 1981-82 Ph.D.s in the NRSA study group to 75 of the 1991-92 cohort.

Figure 4.1
**Average Time Enrolled in Graduate Study for
 1981-92 Behavioral Ph.D. s by Group and Major Field**

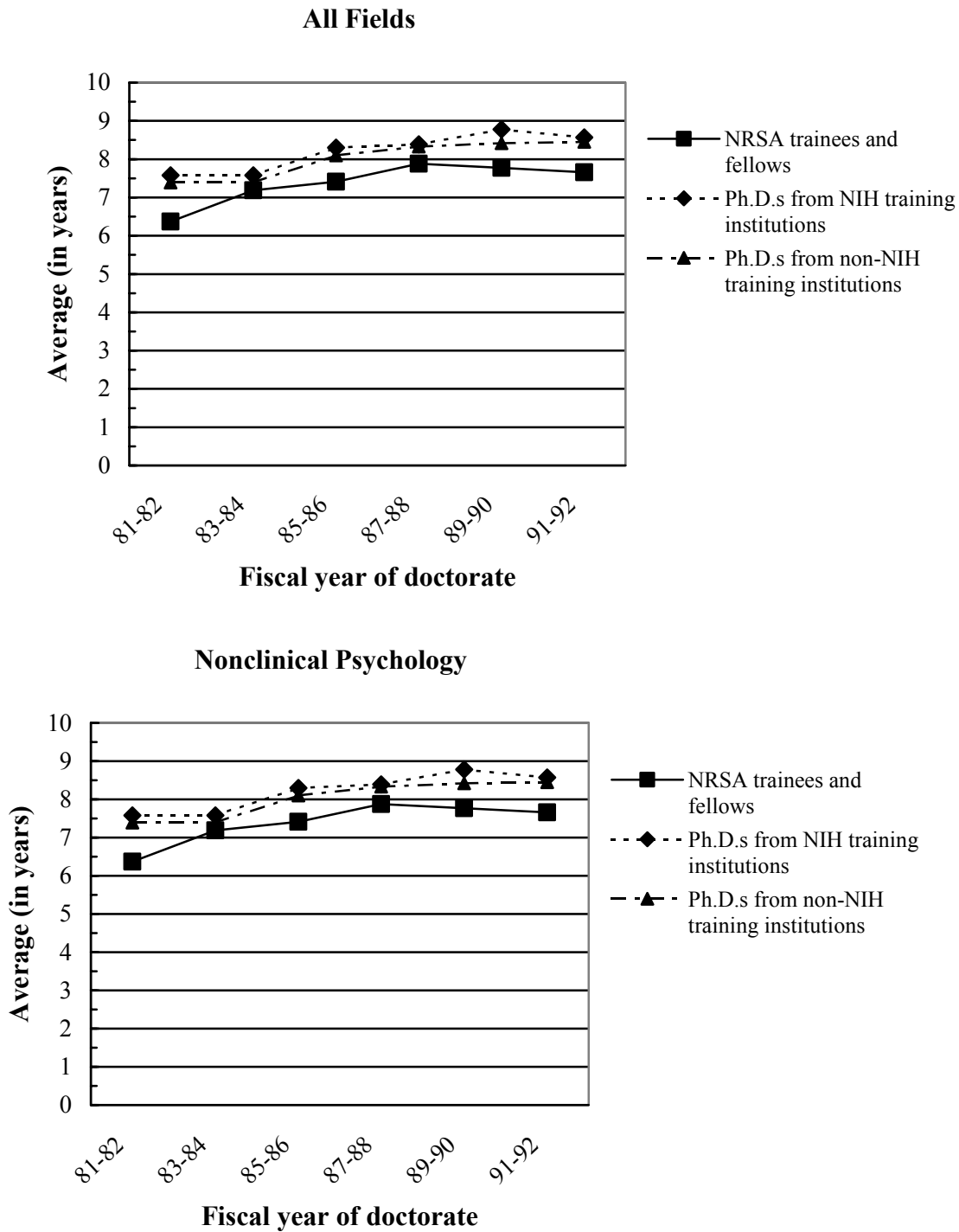
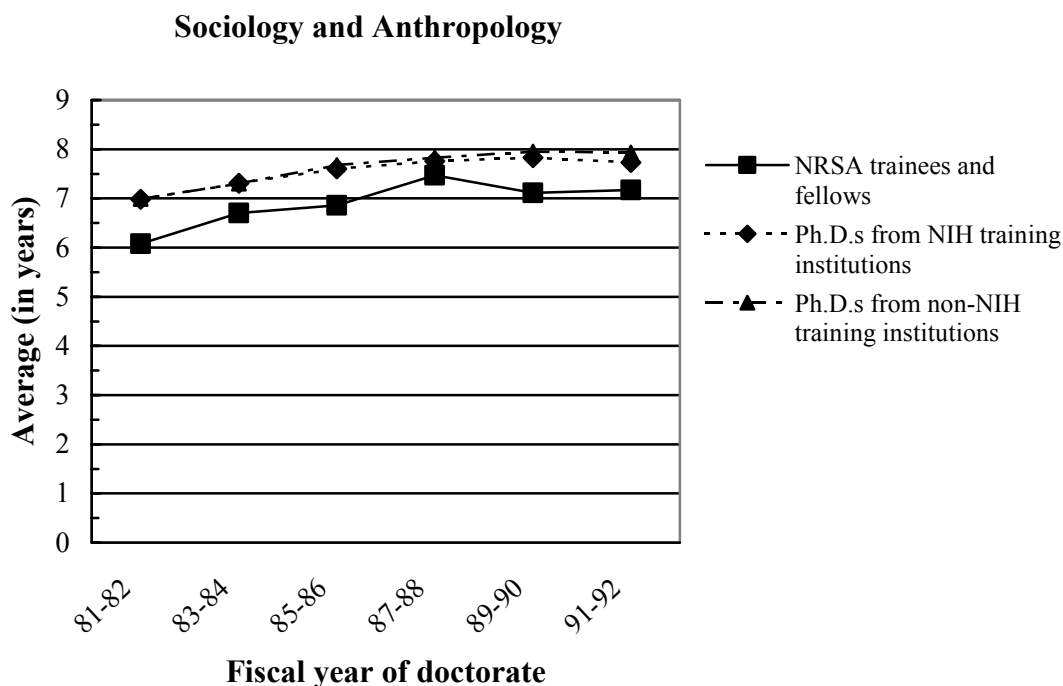


Figure 4.1 (continued)
Average Time Enrolled in Graduate Study for
1981-92 Behavioral Ph.D. s by Group and Major Field



Note. Data are from Appendix Tables E.1a – E.1c.

The Role of NRSA Predoctoral Support and Other Factors on Time-to-Degree

A multitude of factors influence time-to-degree, some of which are unrelated to experiences associated with the receipt of an NRSA predoctoral traineeship or fellowship. To more closely examine the role of NRSA support, multiple regressions were performed in order to take into account some of these variables. Included in the analyses as potential predictors were: demographic characteristics (gender, race/ethnicity, and age); the year and field of the Ph.D.; the reputational quality of the baccalaureate and doctorate-granting institutions; the primary type of graduate support; other characteristics of training (receipt of a master's degree and time not enrolled in graduate study between entry into graduate school and earning of the doctorate); and the type of marketplace faced by graduates (e.g., the percentages of individuals in each field and cohort who had definite postgraduation commitments). These variables have been shown in previous research to be related to completion times and degree progress.

As previously reported, the unadjusted comparisons found that former NRSA trainees and fellows typically completed their doctorate in eight fewer months than those from departments without NRSA training support and nearly a year more quickly than their fellow graduate students from the same programs. The results of the regression analysis, incorporating the above variables, suggest that completion times were most affected by four variables (see Appendix Table E.2). First, consistent with the trends described earlier, time-to-

degree steadily lengthened with each successive cohort. However, the field of one's degree had a larger influence in determining the years spent pursuing a doctoral degree, all else being equal; the average RTD was 8.6 years for sociology and 9.3 years for anthropology but only 7.5 years for psychology. This most likely reflects differences in the nature of research training among these disciplines. For example, laboratory-based experiments are usually more circumscribed and controlled and require less time than field-based data collection (e.g., in-depth interviewing and participant observation). While experiments often are the basis of dissertation research in psychology, they are rare in anthropology and sociology.

Graduating from an institution different from where one earned a master's degree also contributed notably to extending the time spent in graduate school (by approximately 14 months). In line with previous studies, primary reliance on one's own earnings to finance graduate study lengthened graduate study considerably (by about nineteen months). The remaining variables, including those on which the NRSA study and comparison groups differed initially (e.g., gender and age upon entry to graduate school), either were nonsignificant or played a very small role.

After controlling for these other factors, former NRSA trainees and fellows continued to have shorter completion times, earning their degree in an average 6.3 years as contrasted with 8.1 years for each of the two comparison groups. However, the contribution of NRSA support to this speedier degree progress was small, albeit statistically reliable.

Explaining Differences in Time-to-Degree Among NRSA Predoctoral Trainees

Although NRSA predoctoral support appeared to play a minor role in reducing the time-to-degree, identifying certain features of NRSA predoctoral training can aid in future planning of program guidelines and policies. This is not to say that faster completion times are a major objective. However, when students take longer to earn their doctorate, departments committed to supporting their graduate students must locate additional funding. In addition, increased tuition, living, and other training costs have risen at a faster pace than the NRSA training budget, prompting the NIH to limit the amount reimbursed for tuition so as not to either reduce the size of existing awards (e.g., the number of slots) or fund fewer new applications. In the behavioral sciences where additional postdoctoral training is not yet the traditional expectation, shorter degree time also implies quicker progress toward becoming an independent researcher.

Regression analyses were conducted for all Ph.D.s who had received NRSA traineeships, including as predictors the variables previously listed as well as a limited set of descriptive indicators about training programs. These included: months of NRSA predoctoral support; receipt of both a traineeship and fellowship (which may indicate individual talent and ability to progress through a doctoral program); the "maturity" of the training grant as reflected by the number of years that it had been in operation and the number of Ph.D.s produced by the time the person had completed the degree; the timing of the NRSA predoctoral appointment (initiated during first three years of graduate study versus later); and the school/college of the training grant. Each was chosen because of its potential for affecting the time required to complete the doctorate.

For example, during the first few years of a training grant, courses and other components may change as programs gain greater experience in training students in a newly developed research area. Among behavioral science trainees, the large majority were supported by fairly "young" training grants; whereas 38 percent of former biomedical trainees were supported by a training grant that had been in operation for five or

fewer years, this was true for 70 percent of the former trainees in psychology, sociology, and anthropology.³ This also may have implications for a “critical mass” of graduate students who share training experiences and provide peer support. Approximately two fifths of the former behavioral science trainees had been supported on training grants that had produced 10 or fewer behavioral science Ph.D.s across the time period examined. Thirty-six percent had been appointed to grants that had graduated 11-20 Ph.D.s, and the training appointments of the remaining 20 percent were on grants that had produced 21-40 Ph.D.s. Once again, this is a different situation than that for the biomedical sciences where approximately half of the former trainees had been in NRSA programs that had produced more than 30 doctorates.

In a separate regression, this group of NRSA training-related variables accounted for approximately 12 percent of the variation in time-to-degree among trainees. Adding the non-NRSA variables (e.g., Ph.D. cohort, field, and prestige of the doctoral institution) increased this to 35 percent (see Appendix Table 4.3). Significant contributors again were Ph.D. cohort, field, primary reliance on outside employment to finance one’s graduate study, and entering a doctoral program with a master’s from a different institution. However, the influence of the NRSA training variables, when adjusted for these other factors, did not erode.

Similar to the biomedical sciences, the three most influential program variables were the length of support, the timing of support, and the “maturity” of the training grant. Being supported for more than 24 months increased degree time but not by a great deal; behavioral scientists with 1-2 years of NRSA support graduated in an average 7.0 years compared to 7.3 years for those who were on training grants for more than two years, controlling for all other variables. Being placed on a training grant within the first three years of graduate study versus later, however, *decreased* time-to-degree by an estimated 13 months. Controlling for all other variables, the means for trainees whose support occurred early on were 6.8 years versus 7.9 years for those receiving their first support after that. In addition, those who viewed their traineeship as primary were more likely to complete their degree in a shorter period of time — an average of 6.5 years versus 7.5 years for individuals who did not share this view, all else being equal.

When provided early in the doctoral program, longer periods of support increased time-to-degree much less than when provided late. Among trainees and fellows who received their support early in the course of their graduate study, the adjusted means for those with two or fewer years of NRSA predoctoral support versus more were 6.7 years vs. 6.9 years. However, for those who were appointed to training grants after being in graduate school for more than three years, the average adjusted time-to-degree was 7.6 years for those with 1-2 years of support; extending this support brought completion time to 8.6 years. These results are similar to what was observed in the biomedical sciences. They suggest that targeting traineeships for those engaged in the early stages of their doctoral study, all other things considered, may facilitate progress through graduate school and permit individuals to more quickly move toward establishing a research career.

Summary

In the behavioral sciences, which experienced a steady lengthening of the time required to earn a doctorate but fewer external funds for supporting doctoral students, former NRSA trainees and fellows, on average, had shorter completion times than those who graduated from the same departments but were not awarded NRSA support or who graduated from departments with no NIH training grants. This pattern was

³Another 25 percent of behavioral science trainees received their support from grants that had seen 6-10 years of funding, and the remaining 5 percent were appointed to grants that had been in place for more than a decade (as contrasted to 20 percent of former biomedical science trainees).

true for both psychology doctorates and those with sociology and anthropology degrees. When examined more closely, the actual role of NRSA predoctoral support – over and above other factors influencing the length of graduate study – was found to be quite small.

At the same time, those provided traineeships in the very early years of graduate school were more likely to complete graduate study in less time than those whose support began later in their graduate study. Completion times also were shorter for trainees and fellows who viewed this award as their primary source of graduate support. Given that lengthier degree time can be disadvantageous (e.g., dissuading talented individuals from applying to doctoral programs and increasing individual and program costs of obtaining a Ph.D.), practices that shorten time-to-degree should not be casually dismissed as unimportant.

It is interesting to note that providing support to trainees for more than two years did not seem to appreciably increase time-to-degree. This was similar to the results found when comparing degree times for biomedical sciences trainees who were supported for less versus more than three years – the median length of support in the biomedical areas. It is not clear why duration of support has been shorter in behavioral science programs, although it may be tied to the overall shorter period of time that training programs have such grants (only 14 percent of the training grants in this study were still active as of FY 1997).

Initial Plans Upon Receipt of the Doctoral Degree

The primary objective of the NRSA programs is to attract and prepare individuals for careers in research in areas that address major health-related problems. However, new doctorates in the behavioral sciences, like many of their counterparts in other disciplines, faced a shifting job market throughout the 1980s and early 1990s. For example, whereas approximately three-fifths of 1977 doctorates in the nonclinical fields of psychology held academic positions one year after their graduation, this was true for only 47 percent of 1986 doctorates and 38 percent of 1996 Ph.D.s. (Commission on Professionals in Science and Technology, 1997; Pion, 1986). At the same time, nonacademic opportunities have flourished. Based on data from the 1995 Survey of Doctorate Recipients (SDR), nonacademic settings were the full-time employers for over half of all 1981-92 psychology doctorates whose primary activity was research, and the corresponding figure for sociology and anthropology Ph.D.s was 49 percent. These trends may have some implications for the types of outcomes expected for those with NRSA predoctoral support and the extent to which they would differ from those who were not trainees and fellows.

Accompanying this changing marketplace has been other changes in employer expectations, particularly those of academic institutions. Unlike the biomedical sciences, postdoctoral training typically has been viewed as less essential in anthropology, sociology, and psychology. Over time, however, its value has increased, particularly among those hiring new faculty. For example, 32 percent of 1992-94 Ph.D.s in psychology reported having had postdoctoral training as compared to 25 percent of the 1975-84 cohorts (Regets, 1998). Of the recent doctorates hired by doctoral psychology departments in 1993-94, 40 percent had completed postdoctoral study (Gelman, Wicherski, & Kohout, 1995).

This section describes the types of postgraduate positions into which NRSA and comparison group members in the behavioral sciences moved upon completion of their doctoral degree. A closer look at postdoctoral training is then undertaken in terms of the receipt of NRSA postdoctoral training support within four years of the doctoral degree.

Postgraduation Plans

The extent to which behavioral scientists were moving to research-related positions — either postdoctoral training appointments or jobs where research was a major responsibility — was examined, using information collected from new doctorates at the time that they had completed all requirements for their degree.⁴ Included were individuals who indicated either having signed contracts, made definite commitments with an employer, were negotiating with one or more organizations, or were returning to jobs that they had held prior to entering a doctoral program. Approximately half of the 1981-92 Ph.D.s were moving to jobs in which research was to be their primary or secondary responsibility. Another 22 percent had decided on additional postdoctoral training, while the remainder reported taking positions in which research was not viewed as an essential activity (e.g., teaching, and administration).

This first career move differed for NRSA predoctoral trainees and fellows as compared to new doctorates who did not have such support. Similar to the results for the biomedical sciences, the distinction primarily involved greater participation in postdoctoral study. As shown in Figure 4.2, approximately 40 percent of those with NRSA predoctoral training reported definite postdoctoral study plans. This figure was 15 percentage points higher than the 24 percent for individuals graduating from the same departments and more than double the 18 percent for Ph.D.s from departments with no NIH training grants. This greater involvement in postdoctoral training among former NRSA trainees and fellows characterized all cohorts.

In each group, the percentages who indicated firm plans for postdoctoral training did inch upwards over time. This was slightly more noticeable for graduates of departments that had NRSA predoctoral training grants, regardless of whether they were supported by these funds. Whereas 15 percent of 1981-82 doctorates from non-NIH funded departments had definite postdoctoral study plans, this figure rose by 6 percentage points to 21 percent of the 1991-92 cohort. However, a 10-percentage point increase occurred for those with NRSA support (from 39 to 49 percent), and there was a 9-percentage point rise for their graduate student counterparts (21 to 30 percent). Since training grants tend to be located in institutions with more distinguished doctoral programs and graduates from these programs may be more likely to have academic aspirations, this may reflect a growing appreciation of postdoctoral training and its value in securing a faculty position.

It is notable that overall attrition from a research career path (as represented in the white slice of the pie graphs) was consistently less likely for NRSA-supported Ph.D.s in the behavioral sciences. In each cohort, a *lower* percentage of NRSA trainees and fellows cited firm commitments for jobs where research was not considered the primary or secondary activity. This is not inconsequential. Whereas one of every four new doctorates in these disciplines reported definite plans to assume positions that may not have fully utilized their research training, this was true for only one of every ten NRSA trainees and fellows.

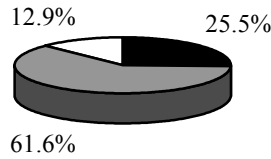
The percentage whose next career move was research-related employment was quite similar for all three groups, ranging from 49 to 52 percent. However, rather than pursuing postdoctoral study as did former

⁴Postgraduation *plans* rather than *positions actually taken* were used in order that field differences could be examined. Although less than ideal, individuals' reports concerning their postgraduation plans have some validity. For example, of the 1988 Ph.D.s who responded to the Survey of Doctorate Recipients (SDR) in 1989, the percentage whose postgraduation plans (i.e., postdoctoral study, employment where research was a primary responsibility, or other employment) matched their current position (i.e., postdoctoral study, employment where at least 25 percent time was spent in research or where research was a primary responsibility, or other employment) was 75 percent.

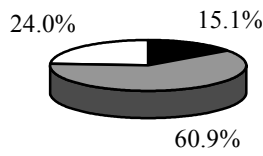
Figure 4.2
Plans of 1981-92 Behavioral Ph.D.s by Field and Group

All Behavioral Science Fields

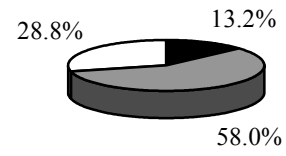
NRSA trainees and fellows



Ph.D.s from NIH training institutions

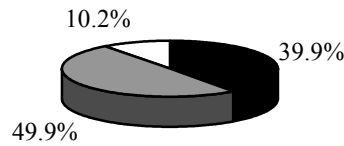


Ph.D.s from non-NIH training institutions

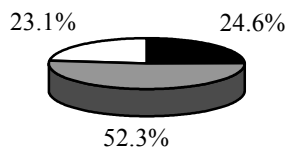


Nonclinical Psychology

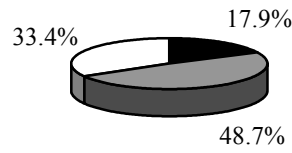
NRSA trainees and fellows



Ph.D.s from NIH training institutions



Ph.D.s from non-NIH training institutions

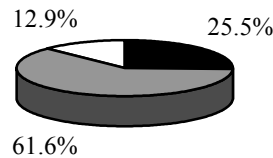


■ Postdoctoral training ■ Research employment □ Other positions

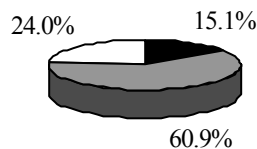
Figure 4.2 (continued)
Plans of 1981-92 Behavioral Ph.D.s by Field and Group

Sociology and Anthropology

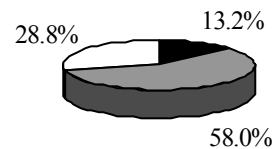
NRSA trainees and fellows



Ph.D.s from NIH training institutions



Ph.D.s from non-NIH training institutions



■ Postdoctoral training ■ Research employment □ Other positions

Note. Included are those doctorates with definite plans at the time of Ph.D. receipt. Data are from Appendix Tables E.4 – E.5.

trainees and fellows, the plans of the two comparison groups more often involved moving to a position where research was *not* a major responsibility.

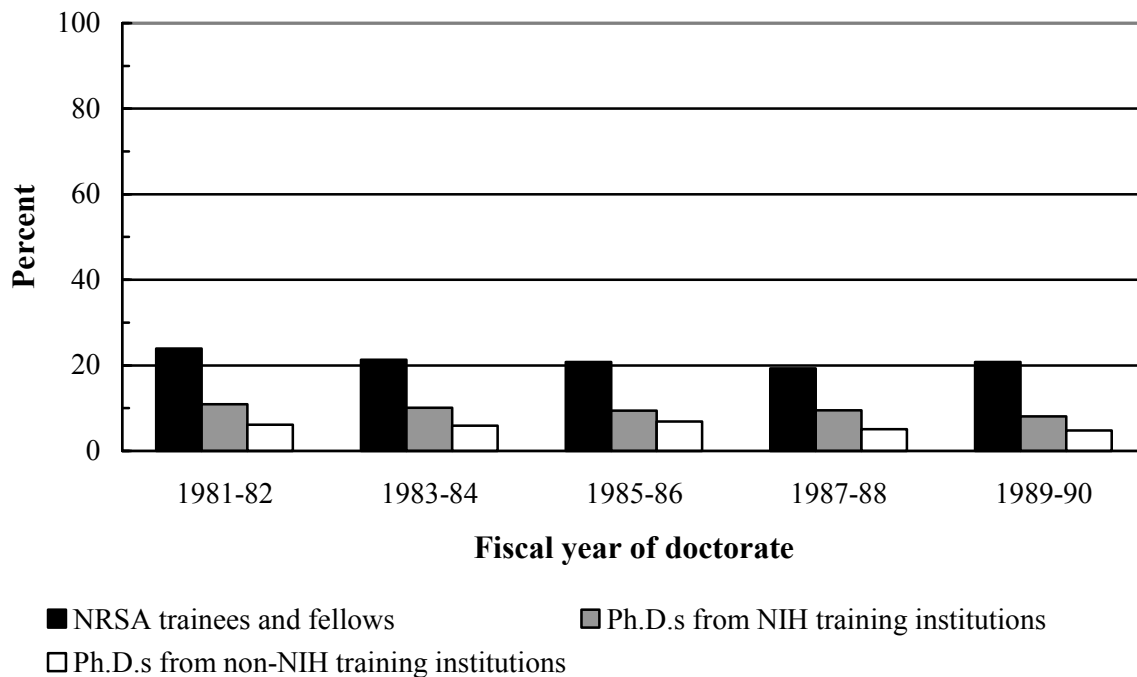
Postdoctoral study did constitute the next step for a larger percentage of former trainees and fellows (46 percent) from psychology programs than from sociology and anthropology departments (26 percent). However, the magnitude of the *differences* between NRSA-supported Ph.D.s and their comparison group counterparts were fairly similar for both disciplines. The proportion of new doctorates in psychology moving to postdoctoral training positions (46 percent) was more than 10 percentage points higher than that of their fellow graduate students in the same departments (33 percent) and more than double that of doctorates from departments with no NRSA training grants (20 percent). Similarly, the corresponding figures for sociology and anthropology were 25, 15, and 13 percent, respectively (see Appendix Table E.4).

A Closer Look at Postdoctoral Training

For those behavioral scientists who undertake postdoctoral study, the NRSA programs fund a healthy percentage of this training. Analyses of the data obtained from the 1995 Survey of Doctorate Recipients (SDR) indicated that among 1981-92 Ph.D.s, approximately one quarter reported having had some type of postdoctoral training, and nearly two fifths of this group received NRSA postdoctoral support. Explicitly targeted at advanced *study* in health-related research, NRSA postdoctoral training should translate into experiences that develop additional research expertise rather than simply employment on faculty research grants. Thus, serving as an NRSA postdoctoral trainee or fellow should be a beneficial career move for NRSA predoctoral recipients; it may also be an outcome consistent with the goal of training investigators for work on important health problems – a goal of the NRSA program.

Across the three groups, less than 10 percent of behavioral sciences Ph.D.s completed nine or more months of NRSA postdoctoral training within four years of completing their degree. Former NRSA trainees and fellows, however, were more than three times as likely to have had NRSA postdoctoral support than individuals graduating from non-NIH training institutions (see Figure 4.3). When contrasted with Ph.D.s from

Figure 4.3
Percent of 1981-90 Behavioral Ph.D.s With NRSA Postdoctoral Training by Group



Note. Data are from Appendix Table 4.6.

the same departments, the difference narrowed slightly but nevertheless remained noteworthy (21 versus 10 percent across all cohorts). For each successive cohort, the absolute numbers with NRSA postdoctoral awards did steadily inch downward in all groups, but the magnitude of the group differences remained fairly constant.

Furthermore, greater participation of former trainees and fellows in NRSA-supported postdoctoral training did not depend on the field of training. Whereas one quarter of psychology doctorates with NRSA predoctoral support also had NRSA postdoctoral traineeships or fellowships, this was true for 13 percent of Ph.D.s from the same departments and only 6 percent of those from departments with no NRSA predoctoral support. The corresponding percentages for sociology and anthropology were 16, 6, and 4 percent, respectively (see Appendix Table E.7).

As previously noted, former NRSA predoctoral trainees and fellows represented a minority of the new doctorates produced between 1981 and 1992 in sociology, anthropology, and the nonclinical fields of psychology – about 10 percent. However, they accounted for nearly one quarter of all NRSA postdoctoral awards made to members of these cohorts (see Appendix Table E.8). Similar to the distribution of predoctoral training sponsors, the NIMH funded the largest number of NRSA postdoctoral training awards in the behavioral sciences. The NICHD was a distant second. As reported for the biomedical sciences, most Institutes funded the postdoctoral training of recent doctorates who had not earlier received NRSA predoctoral support. However, unlike the biomedical sciences where a large fraction (57 percent) of those with NRSA predoctoral support was also sponsored by the same Institute for additional postdoctoral training, this was true for only 12 percent in the behavioral sciences. Although the numbers were small, NRSA predoctoral awardees supported by the NIDA, the NEI, the NHLBI, and the NINDS more often received postdoctoral support from these parent Institutes.⁵

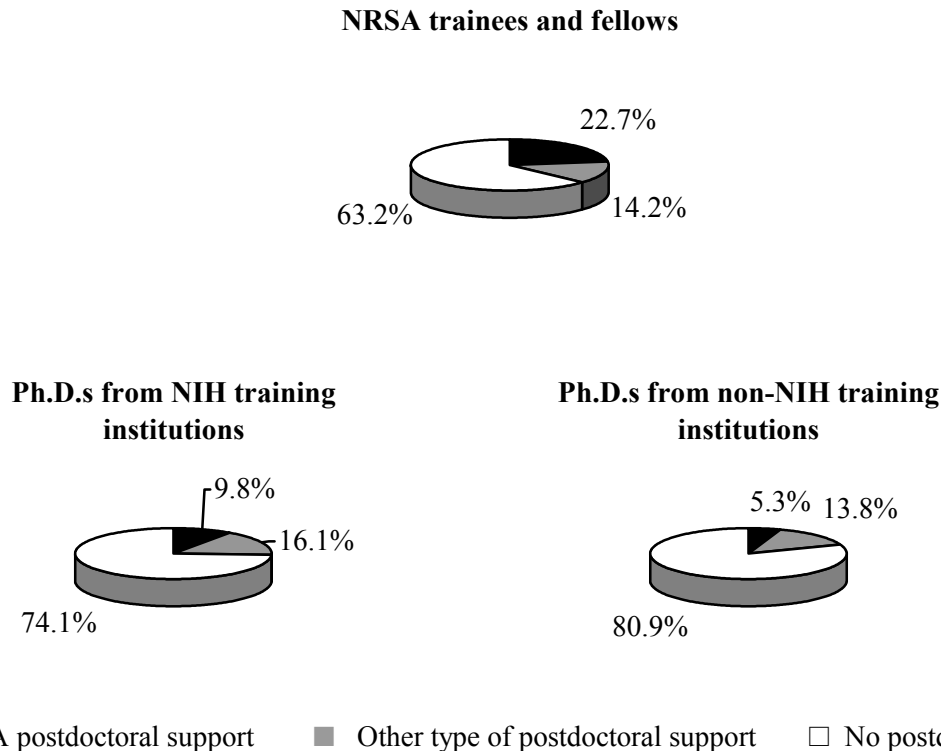
All sources for postdoctoral training. Postdoctoral training opportunities for behavioral scientists also have been sponsored by the National Science Foundation, the Department of Education, Bell Laboratories, and other organizations who award research grants to individual faculty members. To examine the extent to which postdoctoral study was pursued by behavioral sciences Ph.D.s, responses from the 1995 Survey of Doctorate Recipients (SDR) describing receipt of postdoctoral training overall were analyzed. For 1981-92 Ph.D.s, approximately one quarter had at least nine months of postdoctoral study.

Similar to the findings for NRSA postdoctoral awards, a larger proportion of former NRSA predoctoral trainees and fellows had acquired postdoctoral training (37 percent) than either comparison group (see Figure 4.4). Of those who graduated from the same departments as NRSA predoctoral recipients, approximately 26 percent had held a postdoctoral training appointment; the corresponding figure for Ph.D.s from non-NIH training institutions was 19 percent. As Figure 4.4 shows, former trainee and fellow's greater involvement appears to be primarily a function of NRSA-funded postdoctoral positions.

Is this growing involvement in postdoctoral study simply a response to a depressed job market? Across all cohorts, an estimated 13 percent of respondents with postdoctoral training cited the lack of available employment as the primary rationale for taking a postdoc. This proportion remained fairly steady over time and, interestingly, it is not markedly different from that reported by 1981-88 biomedical sciences doctorates (9 percent) – a group who has increasingly expressed frustration regarding the extended time spent in postdoctoral training due to the lack of employment opportunities. Although such sentiments have not been as frequently voiced by behavioral scientists, this may be partly due to not only the smaller number of postdocs but also the difference in the length of postdoctoral training appointments. As reported in Chapter 3, whereas the average postdoctoral training stint in the biomedical sciences was about four years, it was only two years for the behavioral sciences.

⁵This was also true for the NCI but its number of postdoctoral awards to behavioral scientists was small.

Figure 4.4
**Estimated Percent of 1981-92 Behavioral Ph.D.s Who Had
 Postdoctoral Training by Group and Source of Training**



Note. Data are from Appendix Table E.9.

Also, there was little indication that the greater involvement in postdoctoral training by former trainees and fellows was due to their inability to find appropriate jobs. No group had a significantly larger fraction of individuals pursuing postdoctoral training primarily for this reason. Of course, this does not preclude the possibility that the lack of a suitable job was *one* of several reasons. Surveys of 1993 psychology doctorates conducted one year after their graduation indicated that whereas about 15 percent of postdocs in the nonclinical fields indicated that the lack of suitable employment was *the* major reason for taking a postdoc, 31 percent indicated that it as a reason (Wicherski & Kohout, 1995). These figures have, however, not changed noticeably since 1985 although increasing fractions of new doctorates pursued postdoctoral study (Pion, Bramblett, & Wicherski, 1987).

A More Detailed Look at the Decision to Pursue Postdoctoral Training

In addition to enhancing one's qualifications for an academic position or being unable to locate appropriate employment, other factors have been shown to affect the decision to pursue postdoctoral study. For example, Zumeta (1985) found that those who pursued postdoctoral study tended to be white and have graduated from higher quality departments. Forms of financial assistance during graduate school were related to doctorates' postgraduation plans; those primarily supported by research assistantships, teaching assistantships, fellowships, and traineeships were more likely to take research jobs or opt for additional

postdoctoral training (Rapoport, 1998). The influence of these and other variables has changed over time, however, and has not been examined separately for the behavioral sciences. Consequently, it is useful to explore the extent to which NRSA predoctoral support influences the receipt of postdoctoral training, controlling for these and other factors that have previously been linked to postdoctoral study.

These analyses again relied on data describing prior and current postdoctoral training collected in the 1995 Survey of Doctorate Recipients (SDR). Logistic regressions were performed, using data from the FY 1981-92 cohorts.⁶ Variables used to predict postdoctoral study included several of those previously found to be related to postdoctoral training and for which the NRSA study group and one or both comparison groups differed. Among these were age at entry into graduate school, quality of the doctorate-granting institution, primary source of support, field of Ph.D., and time-to-degree.⁷

Similar to the results for the biomedical sciences, the field of the doctoral degree emerged as the strongest predictor of postdoctoral training (see Appendix Table E.10). New psychology doctorates, all else being equal, were the most likely to have had pursued postdoctoral study; whereas an estimated 30 percent of psychology Ph.D.s received some type of postdoctoral training, this was true for considerably smaller percentages of anthropology (20 percent) and sociology Ph.D.s. (10 percent).

For those who received their training from NRSA-funded departments, the other strong influence was their graduate education was financed. Among those who primarily supported themselves by outside jobs, only 8 percent moved to a postdoctoral training position as compared to 35 percent of those whose support came from other sources. Looking at differences between NRSA trainees and fellows and those from departments with no NIH training grants, however, interruptions in graduate study were influential. Not being enrolled for at least one or more years after beginning a graduate program decreased the likelihood of postdoctoral study by 11 percentage points (from 34 to 23 percent). Similarly, graduating from a department ranked in the bottom half of behavioral science programs also made postdoctoral training less likely – 18 percent of these individuals pursued postdoctoral study versus 27 percent of their counterparts from more distinguished programs. Once these and other factors were taken into account, however, the role of NRSA predoctoral support, however, did not significantly help to explain these differences.

Summary

Graduate education in the behavioral sciences has traditionally trained individuals to function as independent investigators upon receipt of their Ph.D. In fact, approximately half of the 1981-92 doctorates in psychology, sociology, and anthropology had obtained definite commitments or were negotiating for research-oriented jobs, and this percentage did not differ markedly for the NRSA study and comparison groups. However, it has become increasingly common that academic employers view postdoctoral training as a

⁶These regressions compared participation in postdoctoral training, regardless of whether it was an NRSA traineeship or fellowship or supported by an alternative source (e.g., a research assistantship on an NIH or NSF grant). This was necessary due to the lower level of involvement in postdoctoral training for behavioral scientists overall and the small sample sizes for non-NRSA funded training.

⁷These included: (a) gender; (b) graduating from a highly selective baccalaureate institution; (c) interrupting graduate study to work full-time or for other reasons; (d) time required to complete the Ph.D. and (e) “strength” of the labor market as measured by the percentage in a field who had definite commitments at the time of graduation. Year of the doctorate also was included to detect any trends over time. Because of multicollinearity problems with age at the time of the Ph.D. and time-to-degree, age at entry into a graduate program was used.

desirable attribute – a time in which the person has focused on developing a research program without the competing demands of teaching and other responsibilities. One clear difference in career paths between those who were and were not supported by NRSA predoctoral funds was their involvement in postdoctoral study. Consequently, this should provide them with a competitive edge when competing for academic positions. In addition, larger proportions also received NRSA postdoctoral traineeships and fellowships — a signal that this training was in health-related research areas.

These differences favoring NRSA predoctoral recipients were more marked when comparing them with Ph.D.s from departments without NIH training grants. In addition, they did not entirely disappear after controlling for field of degree and other variables. The contribution of NRSA predoctoral support in explaining these differences, however, was small and not statistically reliable.

Despite being unable to attribute postdoctoral training to NRSA support, the greater involvement in postdoctoral study by former trainees and fellows is a positive finding if it influences later accomplishments consistent with the aims of the NRSA programs. For example, behavioral and social scientists who pursued postdoctoral study exhibited stronger track records in terms of publications and other indicators of research productivity (Zumeta, 1985). Moreover, whereas significant fractions of new behavioral scientists reported having committed to jobs that were not focused on research upon graduation, this was less characteristic of those who had NRSA predoctoral support.

Employment and Research Careers

Because NRSA predoctoral training programs are designed to produce individuals who devote their careers to research, the employment of former trainees and fellows is key to understanding their career progress. Unfortunately, the available data are limited in terms of accurately depicting the jobs of behavioral scientists who received NRSA predoctoral support. As previously noted, the chief data resource is the Survey of Doctorate Recipients (SDR), a biennial, panel survey conducted by the National Science Foundation of all U.S. doctoral scientists and engineers. However, the smaller share of NRSA predoctoral awards in the behavioral sciences resulted in extremely small numbers of former trainees and fellows who are included in these sample surveys. This made it necessary to both combine cohorts (1981-86 and 1987-92 doctorates) and examine employment characteristics held in 1995 rather than tracking employment at various points beyond the Ph.D. Data on the employment *plans* of new doctorates at the time of completing their degree were used to supplement these analyses.

Postgraduation Employment Plans

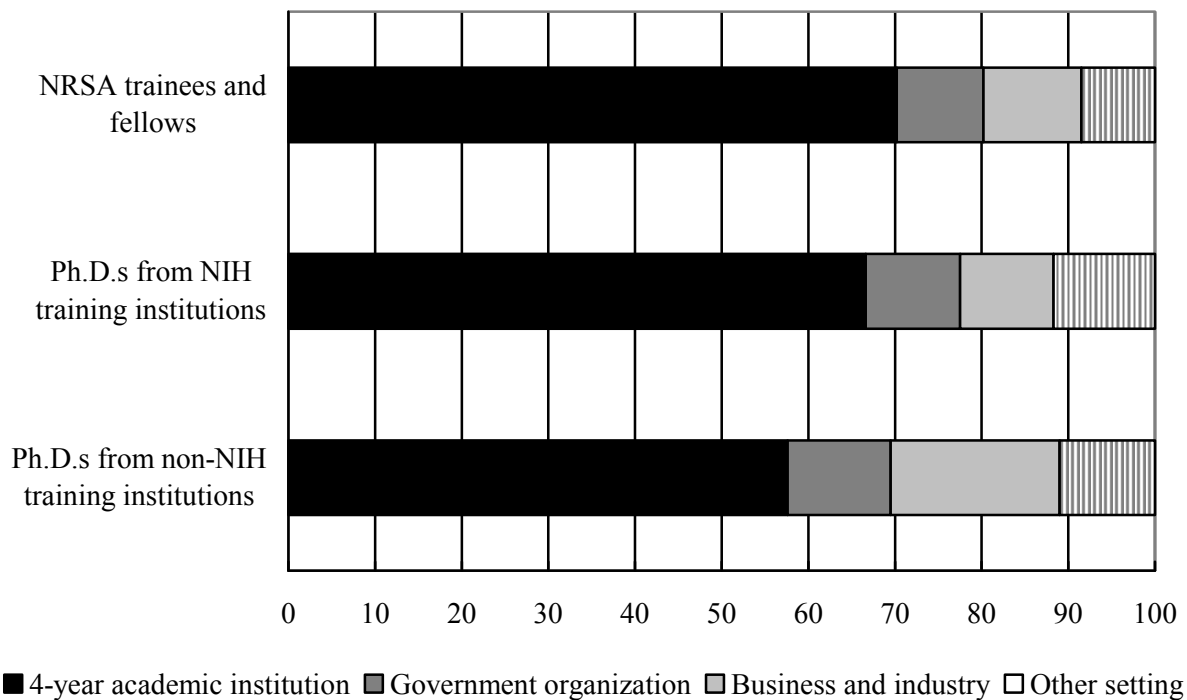
The large majority (about 80 percent) of new Ph.D.s in the behavioral sciences move directly into the work force. Figure 4.5 depicts the settings to which study and comparison groups members planned to migrate upon completion of their degree.¹⁷ Across all cohorts, commitments were very similar for former trainees and fellows and their fellow students who graduated from the same departments. Approximately 70 percent of the former NRSA trainees and fellows indicated that they were moving to positions at four-year colleges and

¹⁷Only included were individuals who were moving into research-related positions – i.e., having academic job commitments in an institution with doctoral research programs or moving into a nonacademic position where research was a primary or secondary responsibility.

universities, with nearly identical percentages going to government agencies (10 percent), for-profit organizations (11 percent), and other types of settings (9 percent). For those who graduated from the same programs, the figures were quite similar – 67 percent were going to positions in academia, and 11-12 percent each reported having obtained jobs in federal, state, and local government, business and industry, and other environments.

Both groups, however, were more likely to report having obtained academic employment than graduates from departments with no NRSA training grants (58 percent). Instead, the Ph.D.s from these programs had negotiated jobs in for-profit companies or were planning to be self-employed. This lack of difference between the NRSA study group and those from the same departments and the small, significant differences between trainees and fellows and those from departments without NRSA training grants were consistent for most cohorts.

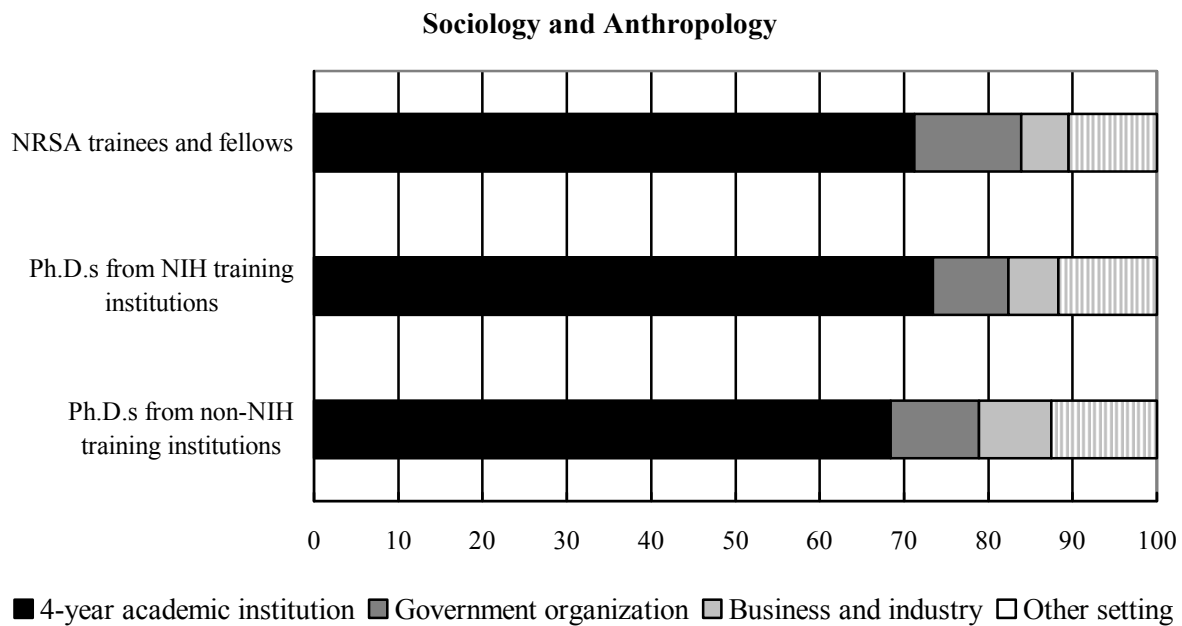
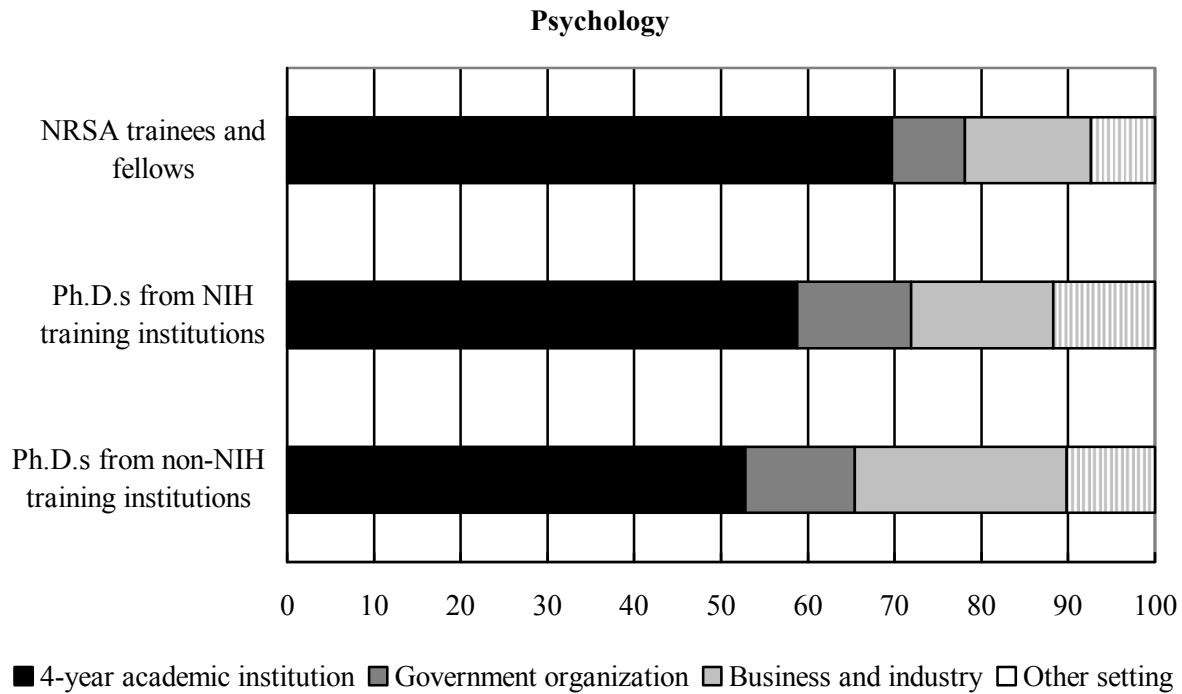
Figure 4.5
Planned Employment Settings for 1981-92 Behavioral Ph.D.s by Group



Note. Data are from Appendix Table E.11. Only those reporting definite plans at the time of graduation are included. Business and industry also include self-employment; other settings consisted of hospitals and clinics, school systems, two-year colleges, and other settings not previously identified.

Plans did differ for new doctorates in psychology as compared to those with sociology and anthropology degrees (see Figure 4.6). In general, new psychology Ph.D.s were considerably less likely to have negotiated an academic position than those in sociology and anthropology (56 versus 71 percent, respectively).

Figure 4.6
**Planned Employment Settings for 1981-92 Behavioral Ph.D.s by Group:
 Psychology versus Sociology and Anthropology**



Note. Data are from Appendix Tables E.12 and E.13. Only those reporting definite plans at the time of graduation are included. Business and industry also include self-employment; other settings consisted of hospitals and clinics, school systems, two-year colleges, and other settings not previously identified.

At the same time, former NRSA trainees and fellows in psychology were significantly more likely to have found jobs in colleges and universities (70 percent) than either comparison group (59 and 53 percent, respectively). In contrast, there were no noticeable group differences between those who had NRSA predoctoral support in sociology and anthropology and their comparison group counterparts.

Type of Employment Setting in 1995

Table 4.1 presents the percentages of behavioral scientists in each group who were working full-time in various settings in 1995. For academic settings, estimates for both tenure- and non-tenure line positions are reported. Among 1981-92 Ph.D.s, colleges and universities employed approximately one half, with 40 percent holding tenure track or tenured faculty positions and 14 percent working in other types of positions (e.g., staff in university-affiliated research institutes or limited-term faculty positions). Another 14 percent were working in business and industry (e.g., banks, polling organizations, and consulting firms), and one third were employed by governmental agencies, hospitals and clinics, and other types of settings or were self-employed. Comparing the 1981-86 and 1987-92 cohorts, there appears to have been a small increase in the percentage holding tenure line appointments (35 to 40 percent), and this was accompanied by a similar reduction in those employed in government and other settings (38 to 33 percent). The percentages in non-tenure line positions and in business and industry remained essentially the same for earlier and more recent Ph.D.s.

The same pattern of differences between former trainees and fellows and the two comparison groups was observed in 1995. That is, the full-time settings in which NRSA predoctoral trainees and fellows were working did not differ significantly from those of Ph.D.s who graduated from the same departments but who did not have NRSA training support. Approximately 48 percent of the NRSA study group was in tenure-track or tenured faculty positions, 18 percent held other types of positions in academic institutions, 11 percent were employed by a business or industry, and 23 percent were in other settings. The corresponding percentages for the NIH training institution group were 40, 15, 15, and 30 percent.

Again, however, the jobs held by former trainees and fellows were distinct from those of behavioral scientists who earned their degrees from departments without NRSA training support. A larger proportion of the NRSA study group was in tenure-line positions (48 versus 34 percent), and a smaller proportion were working in government and other not-for-profit settings (23 versus 41 percent). In addition, there was some indication that the faculty positions of the 1987-92 cohort of trainees and fellows were more often in institutions with highly ranked behavioral science doctoral programs (see Appendix Table E.15). Whereas 26% of NRSA-supported Ph.D.s had faculty positions in these universities, this was true for only 10 percent of the non-NIH training institution group.

Employment in Research-Related Positions

Because being an independent investigator in the behavioral sciences is not restricted to academe, the extent to which individuals had jobs involving research, regardless of the employment sector, also was examined. Here, *research positions* were defined as either: (a) a faculty or other position (but not as a postdoc) in a college or university with one or more behavioral sciences doctoral programs ranked in the 1995 Research

Table 4.1
Employment Settings of 1981-92 Behavioral Science Ph.D.s in 1995 by Group

Employment Setting and Group	Fiscal Year of Doctorate		
	1981-86	1987-92	Total, All Cohorts
Academic positions, tenure-line			
NRSA predoctoral trainees and fellows	50.1	45.8	48.1
Ph.D.s from NIH training institutions	38.1	43.4	40.2
Ph.D.s from non-NIH training institutions	30.7	36.8	33.5
Academic positions, non-tenure line			
NRSA predoctoral trainees and fellows	13.2	22.9	17.7
Ph.D.s from NIH training institutions	13.6	17.9	15.3
Ph.D.s from non-NIH training institutions	12.3	10.9	11.7
Business and industry (including self-employed)			
NRSA predoctoral trainees and fellows	13.0	8.6	11.0
Ph.D.s from NIH training institutions	14.1	16.0	14.9
Ph.D.s from non-NIH training institutions	13.8	13.7	13.7
Other types of settings (e.g., government)			
NRSA predoctoral trainees and fellows	23.7	22.7	23.2
Ph.D.s from NIH training institutions	34.2	22.7	29.6
Ph.D.s from non-NIH training institutions	43.2	38.6	41.1

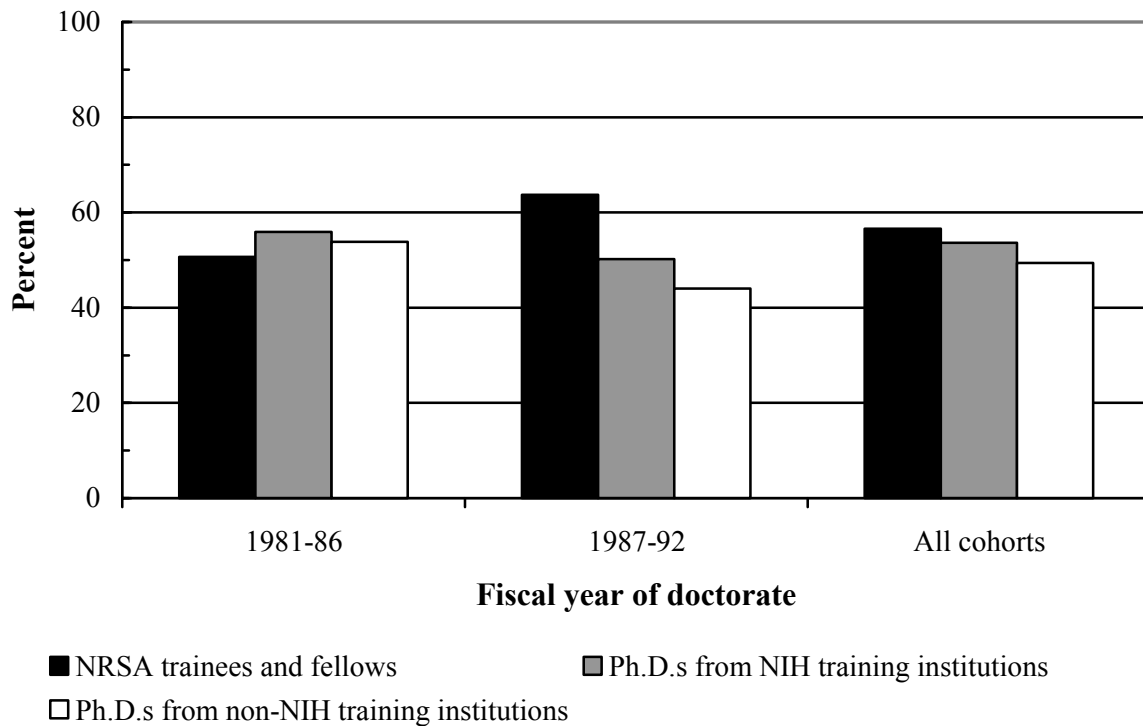
Note. Data are from Appendix Table E.14. Included were those who earned their doctorate in a nonclinical field of psychology, sociology, or anthropology. Employment settings are reported only for those who indicated full-time employment.

Doctorate Study (Goldberger, Maher, & Flattau, 1995); or (b) a job in business, industry, government, or other nonacademic setting where research was the individual's primary responsibility.¹⁸

¹⁸Because research is an important component of most Ph.D. programs that were ranked in the National Academy of Sciences' study, employment in such an institution was used to identify a research-oriented setting. For the

Figure 4.7 shows the percentages of employed behavioral scientists who were in such roles as of 1995. Across all cohorts, more than half were in research-related positions. This group included 57 percent of former trainees and fellows, 54 percent of those from NIH training institutions, and 49 percent of those from non-NIH training institutions. These figures do not represent statistically reliable differences. However, among more recent Ph.D.s, a higher percentage of the NRSA study group reported holding positions where research was a major emphasis as compared to their comparison group counterparts. Here, an estimated 64 percent of trainees and fellows held such employment as compared to 44 percent of those with doctorates from departments without NRSA predoctoral training grants. Looking at individuals who graduated from the same departments as the NRSA study group, approximately half were in such positions, which represented a small difference of marginal statistical significance.

Figure 4.7
Estimated Percentages of 1981-92 Behavioral Ph.D.s in
Research-Related Careers as of 1995 by Group



Note. Data are from Appendix Table E.16.

behavioral sciences, it also proved to be a more appropriate standard than federal or research funding, given the correlations between ratings of the scholarly quality of faculty and the receipt of federal research support reported by Goldberger, Maher, and Flattau (1995) in their study of program quality – i.e., 0.74 in psychology, 0.46 in sociology, and 0.43 in anthropology.

Summary

Each of the two data sources on employment outcomes for behavioral scientists who received NRSA predoctoral support is insufficient by itself for drawing strong conclusions about the performance of former behavioral science trainees and fellows. The results, however, share certain similarities. With regard to both postgraduation plans and subsequent employment in 1995, behavioral science Ph.D.s who had held NRSA predoctoral training appointments were as likely as their counterparts from the same departments to have had firm commitments from academic employers. They also were as likely to report being a full-time tenure-track or tenured faculty member in 1995. This lack of difference may be somewhat predictable, given that a key determinant of obtaining a faculty position has been the reputation of the doctoral program. Given that NIH training grants are awarded to doctoral departments with strong reputations, graduates from these programs, regardless of whether they were supported by these funds, have the same distinguished academic pedigree. Former trainees and fellows were, however, more successful in landing faculty positions than Ph.D.s from departments with no predoctoral training grants, and this difference was most obvious in the more recent cohorts.¹⁹

Seeking and Obtaining External Research Support

This section examines the application and award histories of NRSA study and comparison group members in applying for and being awarded research support from the NIH and the NSF. Although these two agencies are not the only sources of research support in the behavioral sciences, they are clearly important sponsors. For example, the federal share of academic expenditures for research in 1993 was 67 percent in psychology and 50 percent in sociology (National Science Board, 2000). Moreover, the majority of the federal monies directed to psychology and sociology were provided by the Department of Health and Human Services (86 and 62 percent, respectively), with the NSF playing a much smaller role (5 and 17 percent). Consequently, it is not surprising that faculty tenure and promotion committees, particularly in research universities, often consider an NIH or NSF research grant a clear accomplishment.

Using NIH and NSF application and award data to measure success in attracting external research support, however, does have some disadvantages. The primary problem is that only principal investigators are identified as having applied for or received grants in the two agencies' data sets. This means that involvement in research projects as collaborators, co-investigators, or other key roles is not captured. This may be especially salient when looking at individuals in the early stages of their careers who collaborate with more senior faculty on multiple-investigator projects. In addition, individuals in non-faculty, research positions (e.g., research associates) may be precluded by employer policies from applying as an independent investigator, and the previous section suggested that more recent cohorts may be occupying these types of positions. Thus, the percentages for the seeking and obtaining of research support underestimate each group's level of participation even in NIH and NSF sponsored research.²⁰

¹⁹The small sample sizes limited the use of regression models to further examine the influence of other factors (e.g., prestige of the doctorate-granting institution and Ph.D. field) on these outcomes.

²⁰As noted in Chapter 3, a recent survey of FY 1994 applicants conducted by the NIH estimated that 55 percent of biomedical and behavioral scientists were currently principal investigators (PIs) on NIH research grants, another 24 percent were not funded by the NIH but were PIs on grants funded by non-NIH sponsors, and another 9 percent were not designated as principal investigators on any grant but were co-investigators, project managers, and the like on one or more externally funded projects (Pion, Schaffer, Seder, Marks, & Bouchard, 1999).

The majority of the analyses described in the following sections were restricted to the 1981-88 cohorts for two reasons. First, it permits a sufficient time to have passed for those who held postdoctoral training appointments to complete this training and secure positions in which they can apply for external research support. This is particularly important for making fair comparisons of the NRSA study group who were more likely to pursue postdoctoral study. Second, data provided by the NIH cover applications and awards through FY 1994. Given that the median time for applying to either the NIH or NSF for behavioral scientists was six years, more recent cohorts have less time to achieve these outcomes.

Applications to the NIH and the NSF

Figure 4.8 depicts the percentages of individuals in each group who had applied for their first NIH or NSF research grant by FY 1994. As would be expected, the percentage of all applicants decreased with each successive cohort as a function of the shorter time available for submitting applications. However, NRSA trainees and fellows still outperformed the comparison groups in terms of seeking research funding. For example, the percentage of 1981-82 Ph.D.s in the study group who had submitted applications and proposals was noticeably larger (42 percent) than those from the NIH and non-NIH training institutions (24 and 17 percent, respectively). Differences of similar magnitude also characterized 1987-88 behavioral sciences Ph.D.s where 31 percent of former trainees and fellows had applied versus 18 and 14 percent for the two comparison groups. This suggests that the superior performance of behavioral scientists who had received NRSA predoctoral support was consistent over time.

Application rates within seven years of the Ph. D. also were examined in order to control for the influence of differing time to apply for support (see Figure 4.9). Here, it can be seen that the large majority of individuals who applied did so within this 7-year time period. For the NRSA study group, approximately one third had sought research support from either the NIH or NSF, and this fraction was typically 10 to 17 percent nearly double that for Ph.D.s from departments with no NRSA training grants (13 to 14 percent of each cohort had submitted at least one application).

Success Among Applicants in Obtaining One or More Research Grants

Figure 4.10 contrasts the success of applicants in being awarded NIH and NSF research grants.²¹ Although more recent cohorts had less time to prepare a successful grant application, there were no noticeable differences between groups except for the earliest cohort. Among 1981-82 Ph.D.s, nearly three-fifths (59 percent) of former NRSA trainees and fellows had been awarded one or more Research Project Grants (RPGs) by FY 1994. This rate was significantly higher than both the 47 percent of those who earned their Ph.D.s from the same programs but who did not have NRSA predoctoral support. It also was noticeably higher than the success rate of those from departments without NRSA predoctoral training grants. In later cohorts, however, this competitive advantage for the NRSA study group disappeared. For example, among 1987-88 Ph.D.s, success rates were 36, 41, and 31 percent for the NRSA, NIH training institution, and non-NIH training institution groups, respectively. Comparisons that allowed the same length of time to elapse (seven years) from Ph.D. receipt indicated success rates did not differ among the three groups, with the exception of the 1981-82 cohort (see Figure 4.11).

²¹Analyses of award rates (the percent of all Ph.D.s who were awarded funds regardless of whether they applied) produced nearly identical results.

Figure 4.8
Percent of 1981-88 Behavioral Ph.D.s Who Applied for an NIH or NSF Research Grant as of FY 1994 by Group

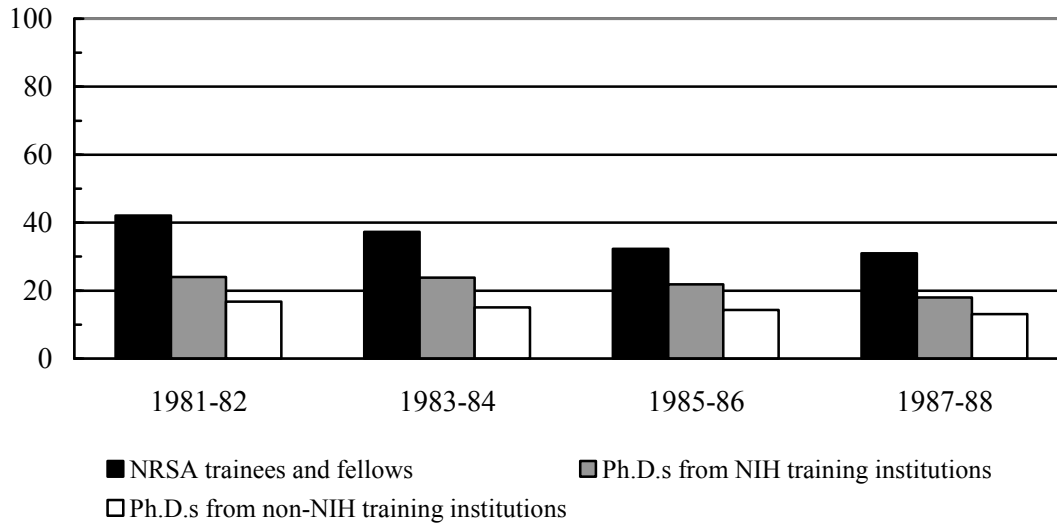
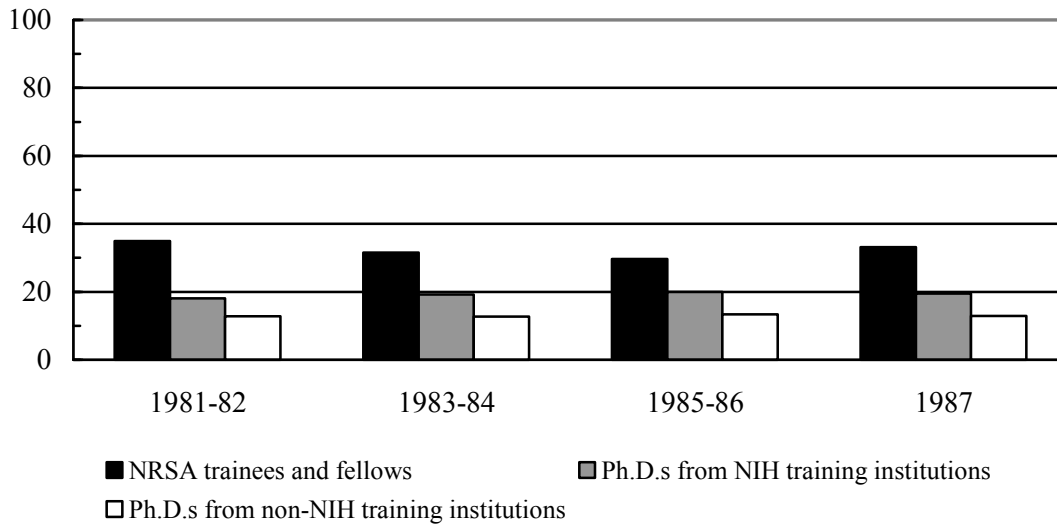
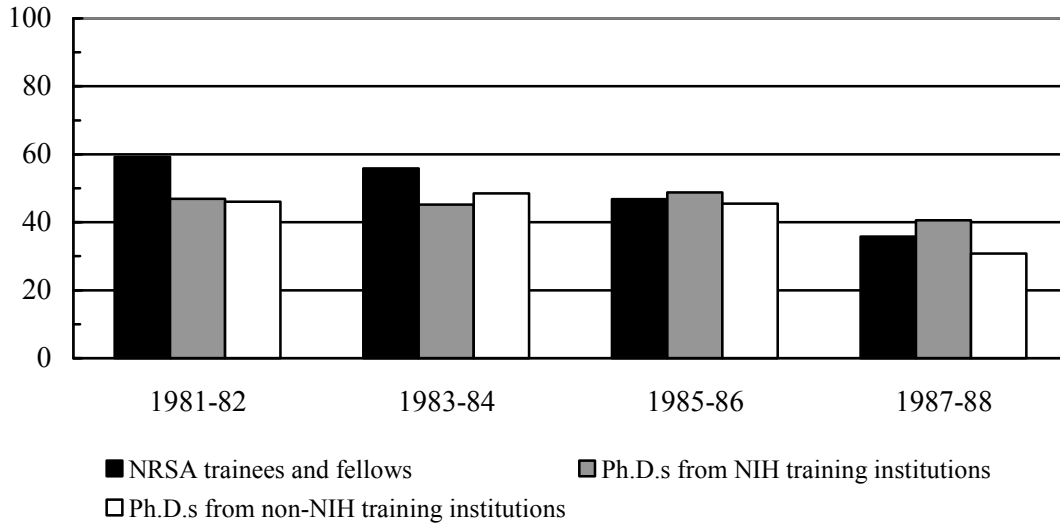


Figure 4.9
Percent of 1981-88 Behavioral Ph.D.s Who Applied for an NIH or NSF Research Grant Within 7 Years of Receiving Their Doctorate by Group



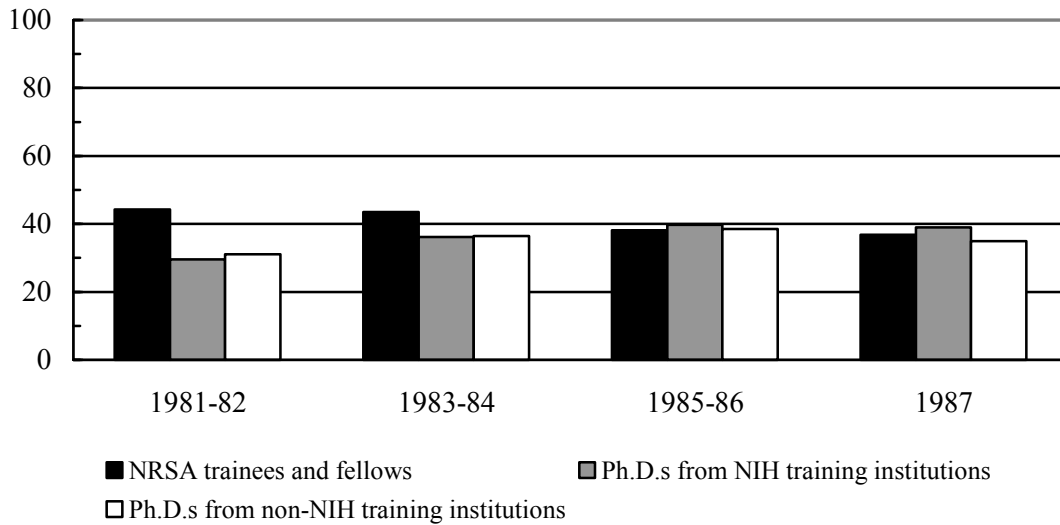
Note. Data for both Figures 4.8 and 4.9 are from the NIH consolidated Grant Applicant File (1995) and from the NSF Master Database of Proposals and Awards (1995).

Figure 4.10
**Percent of 1981-88 Behavioral Ph.D.s Who Applied for
 and were Awarded an NIH or NSF Research Grant as of FY 1994 by Group**



Note. Data are from Appendix Table E.18.

Figure 4.11
**Percent of 1981-88 Behavioral Ph.D.s Who Applied for and Were Awarded an NIH
 or NSF Research Grant Within 7 Years of Receiving Their Doctorate by Group**



Note. Data are from the NIH Consolidated Grant Applicant File (1995) and the NSF Master Database of Proposals and Awards (1995).

Despite this lack of clear differences, it may be that trainees and fellows were more likely to be successful *earlier* in the process, sparing them the need to spend time revising and submitting proposals. The percentage whose application was funded within 12 months of its submission was examined separately for NIH and NSF (see Figures 4.12 and 4.13).²² Once again, however, no strong and consistent pattern of differences emerged. With regard to NIH grants, about 23 percent of the NRSA predoctoral fellows and trainees overall were awarded funds within this time period as compared to 24 percent of doctorates from the same departments and 23 percent of Ph.D.s from departments with no NIH predoctoral training grants.

With regard to early success in obtaining NSF funds, the corresponding percentages for each group did not differ markedly. Between 1985 and 1994, approximately 29 percent of former trainees and fellows applied for an NSF research grant and were awarded support within 12 months of the agency's review data. This percentage was quite similar to that of their fellow Ph.D.s who graduated from the same departments but who did not have NRSA predoctoral support (27 percent). It also was not significantly higher than the 24 percent observed for doctorates from departments with no NRSA predoctoral support.

As is well known, competition for extramural research support intensified during the time period when the study population was most likely to begin its quest for research funding. In FY 1985, the success rate for all competing NIH research program grants (RPGs) was 33 percent; in FY 1994, it was 25 percent (National Institutes of Health, 1995). A similar decline occurred in the success rates of first-time applicants – a group who was typically more likely to be young investigators. For example, although 50 percent of applicants to the NIH are eventually successful in obtaining some type of NIH funding, the percent of those who receive an award in the same year of their application (and thus able to begin working on their chosen research program) declined from 27 percent in 1986 to 21 percent in 1994. In contrast, for those applying to the NSF between 1989 and 1994, however, the overall funding rates have fluctuated little (35 to 37 percent of submitted proposals).

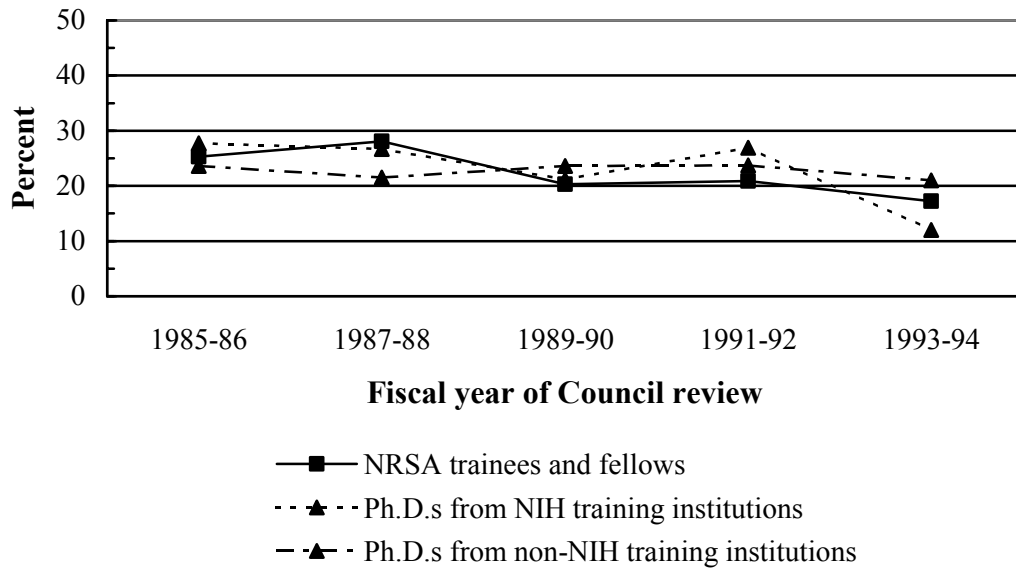
The environment in which behavioral scientists competed for research support also may have changed noticeably. Both the NIMH and the NICHD have been the major sponsors of behavioral sciences research at the NIH. Among the 1981-88 Ph.D.s in this study who applied to the NIH, 26 percent first sought funds from the NIMH, and another 22 percent submitted their first application to the NICHD. Between 1989 and 1994, success rates for competing research projects at the NIMH experienced a noticeable decline, dropping from 31 to 21 percent. This corresponds to the time when 1985-88 doctorates would have begun applying for grants. Among those who applied to this Institute, their success went from 33 percent of 1981-82 Ph.D.s to 23 percent of 1987-88 Ph.D.s. Such factors may have contributed to the lack of group differences observed.

The Role of NRSA Postdoctoral Training

Support for earning a doctorate is not the only type of research training provided by the NIH. As reported earlier, behavioral science Ph.D.s also can receive NRSA awards for postdoctoral study, and the large majority who have had NRSA-supported postdoctoral training were *not* recipients of NRSA predoctoral

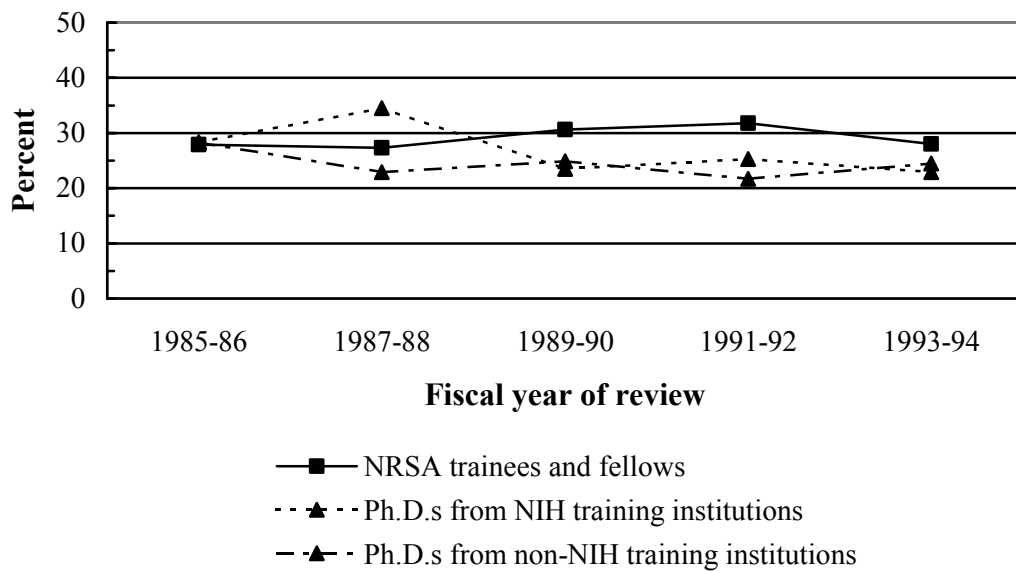
²²Because actual submission date is not part of the data systems, this represents the time between review of the application and the grant start date as indicated in the budget.

Figure 4.12
Percent of 1981-92 Behavioral Ph.D. Applicants Whose NIH Application was Funded Within 12 Months of its First Review by Group



Note. Data are from Appendix Table E.19a.

Figure 4.13
Percent of 1981-92 Behavioral Ph.D. Applicants Whose NSF Application was Funded Within 12 Months of its First Review by Group



Note. Data are from Appendix Table E.19b.

traineeships and fellowships. Thus, the lack of observed group differences may be at least partly due to the influence of this postdoctoral support on the outcomes of the comparison group members. To examine this possibility, each of the three groups was further disaggregated into those who did and did not receive NRSA postdoctoral training support.²³ This also allowed examining whether having had both NRSA predoctoral and postdoctoral training was related to greater application and success rates.

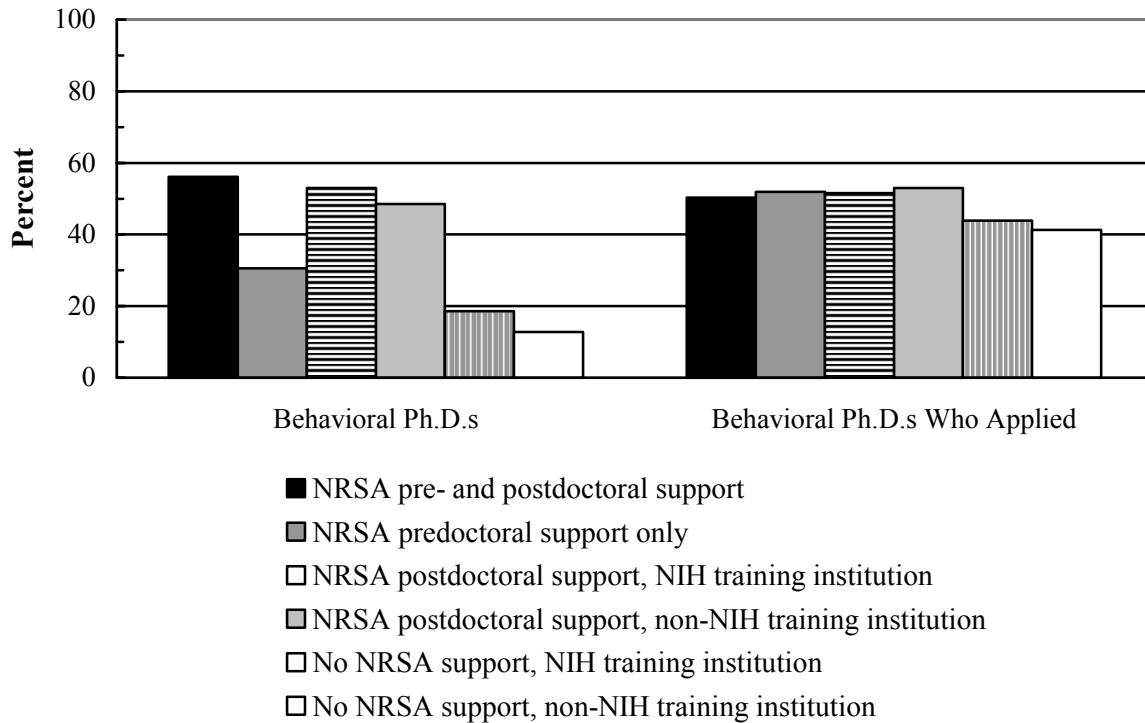
One might speculate that individuals with both types of NRSA training would be more successful in attracting external research support, particularly from the NIH. Those with only NRSA postdoctoral support might perform the same or better as predoctoral trainees and fellows, given that NRSA postdoctoral awards are also made on a competitive basis. However, both might be expected to outperform those with no such training and from departments with no NRSA training grants – whether because of inherent ability, the quality and resources of the institutions at which they receive this training, or additional expertise acquired from the NRSA-funded training experiences themselves. The issue of talent can be somewhat indirectly addressed by comparing those in the same support category (predoctoral versus postdoctoral) but who earned Ph.D.s from different types of institutions (NIH and non-NIH training institutions).

The results of these comparisons are presented in Figure 4.14. With regard to application rates, two points are worthy of mention. First, having *any* NRSA-supported training — predoctoral, postdoctoral, or both — was related to higher application rates. Moderate to large differences between those with NRSA pre- and postdoctoral support, NRSA predoctoral training, or NRSA postdoctoral training and individuals with no such support consistently appeared. Among the NRSA training groups, it also was the case that NRSA postdoctoral training was strongly related to higher application rates. For example, whereas the percentage applying for an NIH or NSF research grant was 56 percent for those with both predoctoral and postdoctoral support, the percentages for individuals who had only received postdoctoral training awards were nearly as large (53 and 49 percent in the NIH and non-NIH training institution comparison groups). In fact, those with *only* NRSA predoctoral support were significantly less likely to have submitted an application or proposal (i.e., 31 percent). They were, however, more apt to have applied when compared to those from their own departments or from those with no NRSA training support (19 and 13 percent, respectively). Finally, the quality of the Ph.D.-granting institution did not play a noticeable role. That is, no significant differences in application rates were found between those who had NRSA postdoctoral training and graduated from more distinguished departments and individuals who earned their degree from non-NIH training grant departments but later received NRSA-supported postdoctoral training.

In terms of applying and being awarded funds, controlling for NRSA postdoctoral support suggested that having any form of NRSA research training support – whether predoctoral, postdoctoral, or both – was associated with somewhat higher success rates. Approximately 50 percent of applicants who had been trained with NRSA funds at both the pre- and postdoctoral levels were awarded one or more NIH research grants by FY 1994. Those who had only been NRSA predoctoral trainees and fellows were equally as successful – 52 percent – as were as those who had not received predoctoral support but had been awarded a postdoctoral training fellowship or traineeship (53 percent of those from non-NIH training departments and 52 percent of those from NIH training departments). In contrast, the success rate was 44 percent for behavioral sciences doctorates who had graduated from the same departments as trainees and fellows but received no NRSA training support. The corresponding percentage for Ph.D.s from departments with no NIH training grant support was 41 percent.

²³NRSA-funded postdoctoral study was used, as these data were available for all members of the study and comparison groups rather than only a considerably smaller sample.

Figure 4.14
**Percent of 1981-88 Biomedical Ph.D.s Who Applied for an NIH or NSF
 Research Grant and Percent of Applicants Who Were Awarded Funds
 by Type of NRSA Support and Doctoral Training Institution**



Note. Data are from Appendix Table E.20.

A More Detailed Look at Group Differences in Application Rates

Because application rates appeared to differ partly as a function of doctoral institution and involvement in NRSA postdoctoral training, the influence of these and other factors were examined more closely.²⁴ Logistic regressions were again performed, controlling for not only cohort, field, and type of postdoctoral training but also for other factors that may affect the successful seeking of external research support. Along with demographic characteristics and selectivity of undergraduate and doctoral institutions, the regressions examined employment in an academic tenure line or non-tenure line position — the location of most applicants — and whether this employer was a major performer of research (as indicated by being in the top quartile of institutions with biomedical doctoral programs). Also included were primary source of graduate support and time enrolled in graduate school, all of which may play some role in initial career choices regarding postdoctoral training and employment.

These analyses were based on those FY 1981-88 doctorates in nonclinical psychology, sociology, and anthropology who responded to the 1995 Survey of Doctorate Recipients. Focusing on this sample permitted

²⁴Similar analyses were not done for success rates, given the lack of consistent differences among the groups.

consideration of postdoctoral training sponsored by all types of sources and current employment. Once again, examination focused on the four earliest cohorts so as to allow a reasonable length of time to complete any postdoctoral training, obtain subsequent employment, and apply for and receive an NIH/NSF research grant.²⁵

The unadjusted application rates for the study and comparison groups were an estimated 52 percent of NRSA trainees and fellows, 28 percent of Ph.D.s who were also trained in the same departments but who did not receive NRSA support, and 19 percent of those who earned their degree from departments without NRSA training grants.²⁶ The results of the regressions, which were again done separately for each major type of comparison, indicated that a handful of career-related variables helped account for the observed differences between NRSA predoctoral recipients and each comparison group. Not surprisingly, holding a tenure-line appointment in 1995 was the strongest predictor. All else being equal, the percentage applying for NIH research grants was 22 percentage points higher for those with such positions as compared to those in other types of jobs. For Ph.D.s who graduated from departments with NIH training grants, holding an NRSA postdoctoral training appointment also increased the likelihood of applying for NIH funding; submitting a grant application was 27 percentage points higher for those who had NRSA postdoctoral training.

It was the case, however, that having NRSA predoctoral support remained influential even after controlling for these other variables. For example, looking at those in tenure-line positions, the percentage of former trainees and fellows who had applied to the NIH was nearly 30 percentage points higher than the percentages of Ph.D.s from the same departments or departments without NRSA training grants who had sought NIH research funding. For individuals who had obtained NRSA postdoctoral funding, those who had also had NRSA predoctoral support also were more likely to apply than their counterparts who did not have such support. Of course, taking into account these and other variables reduced the role of NRSA predoctoral awards. In terms of explaining the differences between trainees and fellows and Ph.D.s from departments without NRSA training grants, the percentage of variance accounted for decreased from 8 percent to 2 percent when controlling for these other variables. When contrasting the NRSA study group with its counterparts from the same academic departments, its role was reduced from 5 to 3 percent. In both comparisons, however, its contribution was larger than that observed for the outcomes previously examined.

Summary

The results of the comparisons between former NRSA trainees and fellows and the two comparison groups yielded mixed results. Although doctorates in the behavioral sciences who had received NRSA predoctoral support exhibited stronger performance records in terms of application rates, this did not carry over with regard to success rates.

Additional analyses, incorporating field, participation in postdoctoral training, and other factors likely to affect application and success rates (i.e., type of employment), reduced the magnitude of the group

²⁵Analyses showed that the mean number of years from the Ph.D. to the first NIH research grant application was six years.

²⁶These percentages, based on the respondents to the 1995 survey, were considerably higher than those reported for the populations in each group (i.e., 30 percent, 18 percent, and 12 percent), and, with the exception of the non-NIH training institution group, they represent significant differences. Given that a substantially larger percentage of respondents in the study group had applied to the NIH/NSF and the respondents in the comparison groups were less different than their respective populations, this should not greatly affect the ability to identify the contribution of other variables.

differences between groups but did not erase them. After taking into account demographic characteristics, the reputation of the undergraduate and graduate institutions, field, primary source of graduate support, postdoctoral training, and post-Ph.D. employment, those with NRSA predoctoral support remained more likely to seek NIH and/or NSF funding than those from NIH training institutions and non-NIH training institutions. Although other variables (e.g., having a faculty position, NRSA postdoctoral training support, and a Ph.D. from a top-ranked program) helped in explaining group differences, having an NRSA predoctoral trainee or fellow did account for a small percent of the between-group variation.

Having applied, however, the performance of NRSA predoctoral trainees and fellows did not surpass their fellow Ph.D.s who had not had such support across all cohorts. The earlier cohorts did exhibit some differential success, but the differences were small and disappeared for 1985 and later Ph.D.s. The exact reasons for this are unclear but may be related to an increasingly competitive environment at the NIMH B a major sponsor of behavioral science research at the NIH. Success rates in general at this Institute declined between 1989 and 1994, and this appears to have been reflected among study participants who applied to this Institute during this period.

Recent Publication Activity

Counts involving published articles in peer-reviewed journals are a reasonably well-accepted measure for assessing research productivity. Not only does it possess face validity but in contrast to successful grantsmanship, it can apply to individuals in any setting where research is conducted. This is not to say that the number of authored and coauthored articles completely captures independent scholarship, particularly in those fields where books and book chapters are well-recognized forms of disseminating the results of one's research. In addition, high publication counts are not totally synonymous with high quality research, and thus, citation counts and citation rates are also used to address the quality dimension.

Although publication counts and citation rates were obtained for all 1981-82 and 1987-88 behavioral science doctorates who were sampled by the NSF's biennial Survey of Doctorate Recipients (SDR), they proved less than informative in examining group differences in research productivity. This primarily was a result of the small sample size for NRSA trainees and fellows and the high variability on these measures. As such, an alternative strategy was used, which involved examining more recent publication of journal articles and presentations at regional, national, and international conferences. These data were available on all 1981-90 individuals who responded to the 1995 SDR. Although an incomplete picture of research productivity and the quality of this work, the comparisons do indicate the extent to which individuals were active publishers within 5 years of the survey.

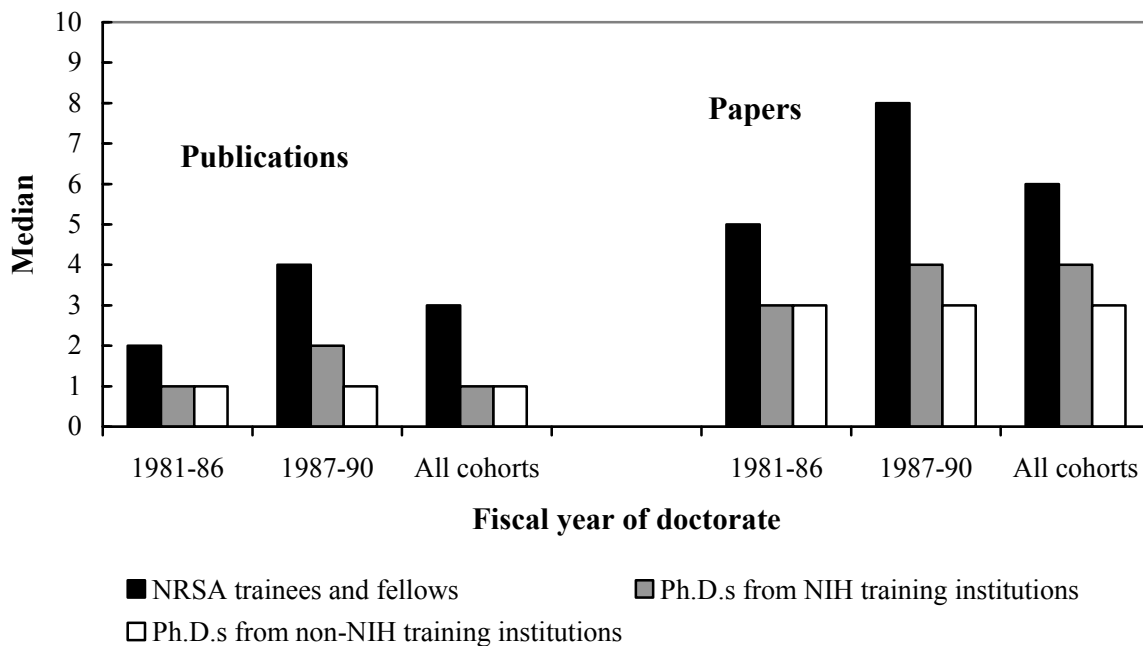
When journal articles are used as a measure of research productivity, behavioral scientists generally have been less active as compared to other scientific disciplines. For example, among all science and engineering Ph.D.s, the average number of articles published between 1990 and 1995 was 4.7, and only 37 percent reported having published no articles at all during this time period (Brown & Henderson, 1998). Psychologists and social scientists had the lowest means (2.8 and 3.1, respectively), and psychologists also had the highest percentage of individuals reporting no publications during this time period (56 percent).²⁷ Focusing on the 1981-90 doctorates examined in this study, about two fifths said they had published no articles within the past five years, including 45 percent of nonclinical psychologists, 41 percent of sociologists, and 38 percent of anthropologists.

²⁷This is partly due to the inclusion of clinical, counseling, and school psychologists in their analysis.

Across all cohorts, former trainees and fellows were more productive in terms of journal publications. Whereas only 30 percent reported having authored no articles, this was true for 42 percent of their fellow graduates from the same departments and 46 percent of individuals whose training was in departments with no NRSA predoctoral support. As depicted in Figure 4.15, the median number of journal articles also was higher for NRSA study group members (3 versus 1 article for both comparison groups). That is, at least half of the former trainees and fellows had published more than 3 articles, but this characterized only 32 and 28 percent of their NIH and non-NIH training institution counterparts. This translated into means of 5.1 articles published or accepted among those with NRSA predoctoral support as compared to 4.0 and 3.2 for each comparison group, which reflect small but significant differences in favor of former trainees and fellows. A similar pattern was observed with regard to presentations at regional, national, and international meetings.

While encouraging as to the potential value of NRSA predoctoral training in facilitating productive research careers, other factors may be responsible for (or at least contribute to) the greater output of trainees and fellows. For example, traditional predictors of research productivity among scientists have included gender, field, and employment in a faculty position (e.g., Helmreich et al., 1980; Long, 1992; Long & Fox, 1995). To explore the role of these variables in accounting for the observed group differences, multiple regressions were performed, regressing these and other variables on the number of 1990-95 journal articles (see Appendix Table E.23). In both comparisons, having completed postdoctoral training and holding a faculty position contributed to more articles published in or accepted by peer-reviewed journals. Among Ph.D.s from departments with NIH training grants, those who completed their degree in less time or who graduated from more distinguished doctoral programs, all else being equal, also had stronger publishing profiles. Once these and other variables were taken into account, the contribution of NRSA predoctoral support, which was quite small to begin with, was not significant.

Figure 4.15
**Median Number of Articles in Peer Reviewed Journals and Conference Papers
 Between 1990 and 1995 for 1981-86 and 1987-90 Behavioral Ph.D.s by Group**



Note. Data are from Appendix Table E.22.

Summary

In terms of contributing to the recent literature in the behavioral sciences, the available data suggest that NRSA predoctoral recipients in the behavioral sciences were more likely to have authored or coauthored articles in peer-reviewed journals than their comparison group counterparts. Their greater involvement in communicating the results of their research also was reflected in their more frequent presentations of papers at professional conferences. The reasons for these differences, to a noticeable degree, can be explained by variation in the characteristics of their graduate and postdoctoral research training and experiences and their current employment in an academic setting. After controlling for these factors, the role of NRSA predoctoral support did not help in explaining the observed differences.

For several reasons, we are left with a quite incomplete picture of the research productivity of behavioral science trainees and fellows. Recent journal publications as a measure of scholarship are but one indicator, and in two of the behavioral sciences fields (sociology and anthropology), books and book chapters are often a recognized form of scholarship. In addition, the small sample size of former trainees and fellows, coupled with the somewhat greater than expected heterogeneity in publication counts for this group, made examining the quality of authored journal articles impossible.

References

- Alcohol, Drug Abuse, and Mental Health Administration. (1989). *ADAMHA NRSA research training tables FY 1988*. Rockville, MD: Author.
- Bowen, W. G., & Rudenstine, N. L. (1992). *In pursuit of the Ph.D.* Princeton, NJ: Princeton University Press.
- Brown, P., & Henderson, P. (1998). *Doctoral scientists and engineers in the United States: 1995 profile*. Washington, DC: National Academy Press.
- Center for the Advancement of Health. (1999). *Cultivating capacity: Advancing NIH research training in the health-related behavioral and social sciences*. Washington, DC: Author.
- Clouet, D. H. (1996). *The career achievements of trainees and fellows supported by the National Institute of Drug Abuse*. Rockville, MD: National Institute of Drug Abuse.
- Commission on Professionals in Science and Technology. (1997). *Postdocs and career prospects: A status report*. Washington, DC: Author.
- Gelman, S., Wicherski, M., & Kohout, J. (1995). *Characteristics of graduate departments of psychology: 1993-94*. Washington, DC: American Psychological Association.
- Goldberger, M. L., Maher, B. A., & Flattau, P. E. (1995). *Research-doctorate programs in the United States: Continuity and change*. Washington, DC: National Academy Press.
- Helmreich, R. L., Spence, J. T., Beane, W. E., Luckner, G. W., & Matthews, K. A. (1980). Making it in academic psychology: Demography and personality correlates of attainment. *Journal of Personality and Social Psychology*, 39, 896-908.

- Howard, A., Pion, G., Gottfredson, G., Ebert-Flattau, P., Bray, D., Oskamp, S., Burstein, A., & Pfafflin, S. (1986). The changing face of American psychology: A report from the Committee on Employment and Human Resources. *American Psychologist, 41*, 1311-1327.
- Hurlbert, J. S., & Rosenfeld, R. A. (1992). Getting a good job: Rank and institutional prestige in academic psychologists' careers. *Sociology of Education, 65*, 188-207.
- Long, J. S. (1992). Measures of sex differences in scientific productivity. *Social Forces, 71*, 159-178.
- Long, J. S., & Fox, M. F. (1995). Scientific careers: Universalism and particularism. *Annual Review of Sociology, 21*, 45-71.
- Maher, B. A. (1999). Changing trends in doctoral training programs in psychology: A comparative analysis of research-oriented versus professional-applied programs. *Psychological Science, 10*, 475-481.
- National Institutes of Health. (1995). *NIH extramural trends: Fiscal years 1985-94*. (NIH 96-3506). Bethesda, MD: Author.
- National Research Council. (1977). *Personnel needs and training for biomedical and behavioral research*. Washington, DC: National Academy Press.
- National Science Board. (2000). *Science and engineering indicators – 1998*. (NSB-00-1). Arlington, VA: National Science Foundation.
- National Science Foundation. (1998). *Graduate students and postdoctorates in science and engineering: Fall 1996*. (NSF 98-307). Arlington, VA: Author.
- National Science Foundation. (1999). *Characteristics of doctoral scientists and engineers in the United States: 1997* (NSF 00-308). Arlington, VA: Author.
- Pion, G. M. (1991). Psychologists wanted: Employment trends over the last decade.. In R. R. Kilburg (Ed.), *How to manage your career in psychology*. Washington, DC: American Psychological Association.
- Pion, G. M., & Lipsey, M. W. (1984). Psychology and society: The challenge of change. *American Psychologist, 39*, 739-754.
- Pion, G. M., Bramblett, P., & Wicherski, M. (1987). *Preliminary report: 1985 Doctorate Employment Survey*. Washington, DC: American Psychological Association.
- Pion, G. M., Schaffer, W., Seder, P., Marks, E., & Bouffard, J. (1999). *Customer satisfaction and research involvement among applicants for NIH R01 and R29 grants*. (NIH 99-4680). Bethesda, MD: National Institutes of Health.
- Rapoport, A. I. (1998, December 4). *Have forms of primary financial support for S & E graduate students changed during the past two decades?*. (NSF 99-313). Arlington, VA: National Science Foundation.
- Regets, M. C. (1998, December 2). *Has the use of postdocs changed?* (NSF 99-310). Arlington, VA: National Science Foundation.

Schneider, S. (1980). Positions of psychologists trained for research. *American Psychologist*, 35, 861-866.

Syverson, P. D. (1982). *Summary report 1981: Doctorate recipients from United States universities*. Washington, DC: National Academy Press.

Thurgood, D. H., & Clarke, J. E. (1995). *Summary report 1993: Doctorate recipients from United States universities*. Washington, DC: National Academy Press.

Wicherski, M., & Kohout, J. (1995). *1993 Doctorate Employment Survey*. Washington, DC: National Academy Press.

Zumeta, W. (1985). *Extending the educational ladder: The changing quality and value of postdoctoral study*. Lexington, MA: Lexington Books.