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Behavioral and Social Scientists

DEFINING THE WORKFORCE

Past studies of research training needs in the behavioral sciences relevant to health generally defined the target workforce as Ph.D.s trained in psychology, anthropology, sociology, and the speech and hearing sciences. The specific details of that definition have varied: some analyses have focused on psychologists trained in the nonclinical subfields of psychology (such as developmental and physiological psychology), because these individuals are more likely to be involved in research;¹ others included all Ph.D.s in psychology.²

Identifying the workforce of interest is further complicated by the range of research undertaken by behavioral scientists. In the basic biomedical sciences, the majority of the workforce conducts health-related research, but Ph.D.s trained in the behavioral sciences carry out a broad range of research, often unrelated to health and medicine. There is no way to identify or even estimate the numbers of Ph.D.s in the behavioral science workforce who focus on health-related research. Yet this sector of the behavioral workforce plays a critical role. Behavior is increasingly recognized as a key element both in the maintenance of good health and the development of disease. When illness occurs, a patient's behavior often affects the efficacy of treatment and the prospects for recovery.

The extraordinary recent advances in basic neuroscience research have provided significant new opportunities for understanding the linkages between the brain and behavior and for incorporating this knowledge into studies of human health. Simultaneously, behavioral and social science research is increasingly interdisciplinary. The variables that affect health and illness may occur at the molecular, cellular, organ system, behavioral and psychological, and social and environmental levels.³ Recognizing these interactions often requires a broad understanding of the connections between the behavioral sciences, findings from basic biomedical laboratories (especially in pharmacology and biochemistry), and the practice of medicine and public health.

After weighing these factors and reviewing the extent to which graduate education in various behavioral science fields is supported by the National Institutes of Health (NIH), we defined the target workforce for our study as Ph.D.s trained in anthropology, demography, the nonclinical fields of psychology, sociology, and the speech and hearing sciences (see Appendix E). Those who graduate from universities in the U.S. with Ph.D.s in these fields and seek careers in science and engineering in this country are considered part of the behavioral and social science workforce until they retire, die, or leave science and engineering for another field of work.

An analysis of Ph.D.s in these fields will unavoid-

¹ National Research Council. *Biomedical and Behavioral Research Scientists: Their Training and Supply. Volume 1: Findings.* Washington, D.C.: National Academy Press, 1989.

² National Research Council. *Meeting the Nation's Needs for Biomedical and Behavioral Scientists.* Washington, D.C.: National Academy Press, 1994.

³ Anderson, Norman B. "Levels of Analysis in Health Science: A Framework for Integrating Sociobehavioral and Biomedical Research." *Annals of the New York Academy of Sciences* 840 (May 1998): 563-76.

ably include investigators who do not pursue health-related research and exclude others from related fields who may be actively involved in such studies. Economists, for example, were not included in our analysis, even though studies of the economics of health and medicine make major contributions to health-related research. Because less than 2 percent of the nation's economists focus on health economics,⁴ including this field in our analysis would overestimate the size of the workforce. Nonetheless, the definition of the behavioral and social science workforce described above can provide a general estimate of the number of investigators in this field and an indication of the major trends affecting the workforce, such as changes in size, age, and composition.

A PORTRAIT OF THE WORKFORCE

As in the basic biomedical sciences, the behavioral and social science workforce has more than doubled since 1975, from just over 25,800 Ph.D.s to 57,800 in 1997 (see Figure 3-1). In contrast to the steady growth of the basic biomedical workforce during that period, most of the increase in the behavioral and social sciences occurred between 1975 and 1989, when the size

of the workforce climbed from 25,802 to 48,844 Ph.D.s. Growth slowed markedly thereafter, and by 1995 the workforce totaled 52,324 Ph.D.s. By 1997 the number of behavioral and social scientists had jumped again, to 57,843.

This recent growth, however, should be interpreted with caution. A change in the survey methodology in 1993 may have affected subsequent estimates of workforce size by classifying individuals by occupation (e.g., scientist, professor, manager), rather than by scientific field. In addition, part of this reported workforce growth stems from a change in the analysis of survey responses by the National Opinion Research Center when it took over the management of the Survey of Doctorate Recipients in 1997.

Since 1975 the representation of women and minorities in the behavioral and social science workforce has grown significantly (see Figure 3-2). In the mid-1970s, 20.5 percent of the behavioral science workforce were women and 2.5 percent were minorities. Since then, as increasing numbers of women and minorities have earned Ph.D.s in these fields, their representation in the workforce has steadily risen. By 1997, 41.9 percent of behavioral and social scientists were women and 6.9 percent were minorities.

In the absence of a rapid increase of new Ph.D.s, as seen in the basic biomedical sciences, the median age of the behavioral and social science workforce has grown over the last decade, rising from 44.4 in 1987 to

⁴ Sikes, Violet. American Economic Association. Personal communication, October 1999.

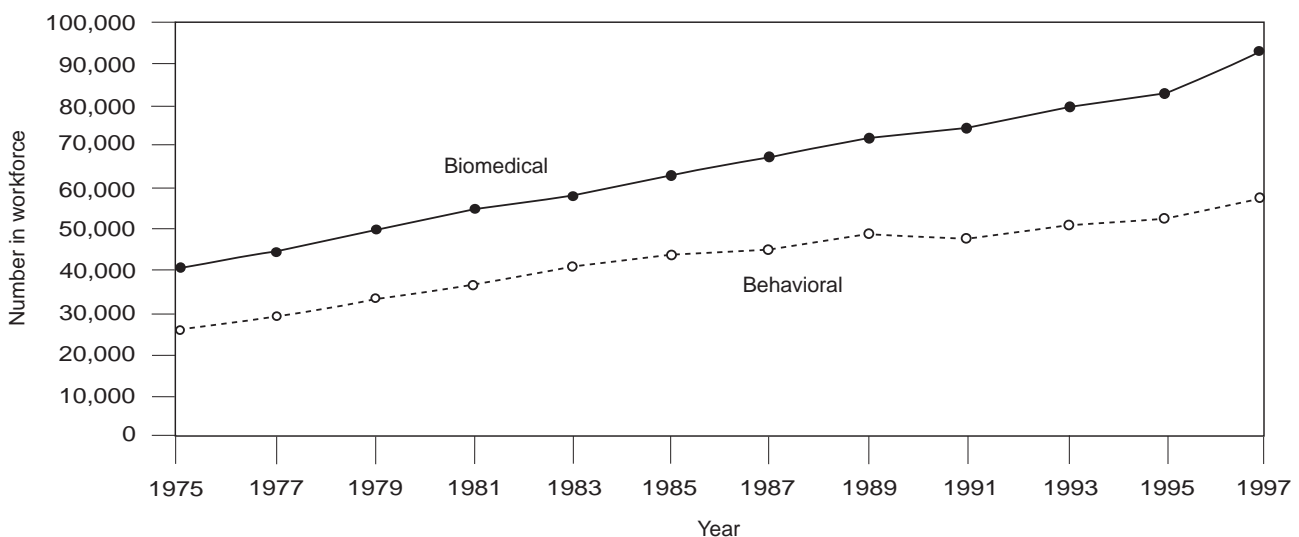


FIGURE 3-1 Growth in the behavioral and social science workforce and the basic biomedical workforce. SOURCE: Data are from the Survey of Doctorate Recipients (see Tables G-4 and G-5).

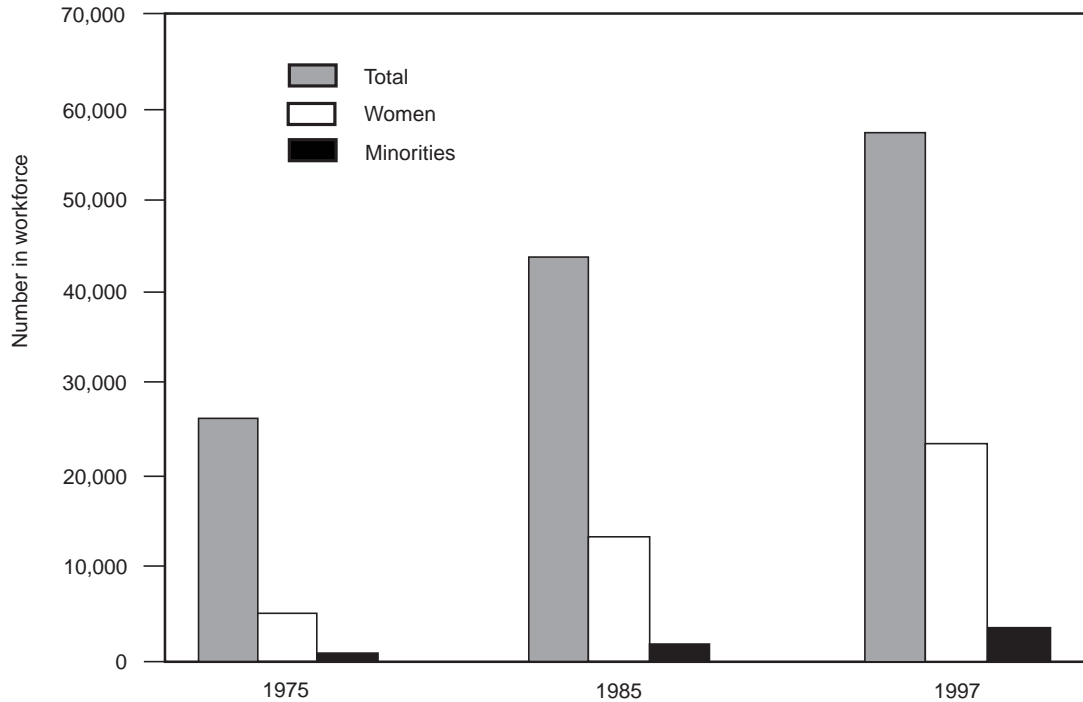


FIGURE 3-2 Trends in the composition of the behavioral and social science workforce. SOURCE: Data are from the Survey of Doctorate Recipients (see Table G-5).

49.8 in 1997.⁵ A demographic analysis of the workforce (described in Appendix D) estimates that the median age of the behavioral and social sciences workforce likely will increase by another two and one-half years by 2005 to 52.4 years. In contrast, the median age of the biomedical workforce is expected to grow less than a year during that period to 46.2.

Unless there is a major departure from current trends in Ph.D. production and retirement, the behavioral and social science workforce is projected to continue growing at a rate of more than 1 percent annually for the next several years. By 2005 this workforce is expected to number nearly 60,000 and include almost equal numbers of men and women.

TRENDS IN THE EDUCATION OF BEHAVIORAL AND SOCIAL SCIENTISTS

Many of the changes in the behavioral and social science workforce reflect trends in doctoral education over the past 25 years. Increasing numbers of women,

underrepresented minorities, and noncitizens have obtained doctoral degrees in the behavioral and social sciences, just as in the basic biomedical sciences. In addition, the time spent earning a Ph.D. in the behavioral and social sciences has grown. Postdoctoral study is not as customary for behavioral and social science Ph.D.s as for those in biomedical fields but has been slowly increasing.

In many other regards, doctoral education in the behavioral and social sciences differs markedly from that in the basic biomedical sciences. Unlike the biomedical fields, in which steadily increasing numbers of Ph.D.s have been awarded since the mid-1970s, the number of advanced degrees earned in the behavioral and social sciences has been rising only since the start of the 1990s, reversing a modest but extended decline that began in the late 1970s and continued throughout the 1980s (see Figure 3-3).

Another area of difference between the two fields is the number of degrees awarded to men (see Figure 3-4). Since peaking at 1,949 in 1976, the number of men receiving Ph.D.s in the behavioral and social sciences has dropped considerably. Men earned less than 40 percent (1,012) of the 2,591 behavioral and social sci-

⁵ Unpublished tabulation from the Survey of Doctorate Recipients; available from the archives of the Academies.

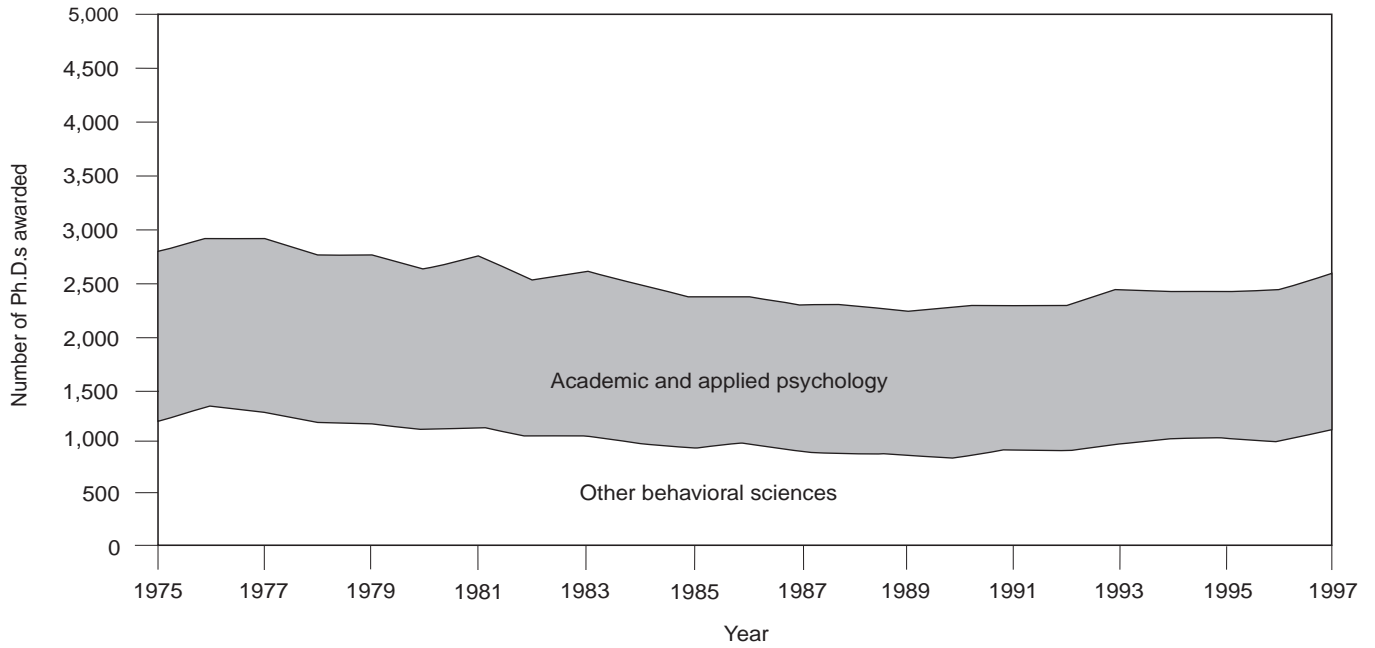


FIGURE 3-3 Ph.D.s awarded in the behavioral and social sciences in the United States. SOURCE: Data are from the Survey of Earned Doctorates (see Table G-2).



FIGURE 3-4 Ph.D.s awarded in the behavioral and social sciences in the United States by gender. SOURCE: Data are from the Survey of Earned Doctorates (see Table G-2).

ence Ph.D.s granted in 1997. As a result, the growth in behavioral and social science Ph.D.s granted in the 1990s is due almost entirely to the increasing numbers of women earning doctoral degrees in these fields. In 1975 women earned just under a third (895) of the Ph.D.s awarded in the behavioral and social sciences; since then their numbers have steadily grown, reaching 1,558 in 1997.

The behavioral and social sciences also differ from the biomedical fields in the fraction of Ph.D.s awarded to underrepresented minorities. Though minorities have earned increasing numbers and percentages of advanced degrees in both fields, they have always been better represented in the behavioral and social sciences. In 1975 underrepresented minorities earned 114 doctoral degrees in the behavioral and social sciences (4.1 percent of the degrees awarded that year); by 1997 that number had grown to 219 (8.5 percent). In contrast, underrepresented minorities earned 4.7 percent of Ph.D.s awarded in the basic biomedical sciences in 1997.

The fraction of behavioral and social science Ph.D.s awarded to noncitizens has also increased, though not as steadily as, and much less dramatically than, in the basic biomedical sciences. The percentage of doctoral degrees in the behavioral and social sciences awarded to individuals holding temporary visas increased from 6.8 percent in 1975 to 12.9 percent in 1993. The percentage of degrees earned by temporary-visa holders decreased to 9.8 percent in 1997.

Along with these other changes, the number of years spent earning a Ph.D. in the behavioral and social sciences increased sharply from the mid-1970s to the late 1980s. Although time to degree has declined slightly since then, doctoral recipients in 1997 received their degrees 8.8 years after beginning graduate study, in contrast to the six and one-quarter years typical for those graduating in 1975 (median time to degree as measured from entry into post-baccalaureate study). As a result, the median age of new Ph.D.s in the behavioral and social sciences today is 33.4, three years older than those who graduated in the mid-1970s.

Time to degree and the median age of new Ph.D.s have always been greater in the behavioral and social sciences than in the biomedical disciplines, but the disparity between the two fields has grown over the last two decades. The basic biomedical Ph.D.s awarded their degrees in 1997 completed their graduate studies in 7.8 years, at a median age of 30.9.

Of course, a career in the basic biomedical sciences

today almost invariably requires a postdoctoral fellowship, which extends the time spent in training. Though on the increase, postdoctoral study is not the norm for most behavioral and social science Ph.D.s; 18.8 percent of new Ph.D.s in the behavioral and social sciences in 1997 reported plans for postdoctoral study, up from 12.5 percent in 1975. In contrast, nearly two-thirds of 1997 Ph.D.s in the basic biomedical sciences expected to pursue postdoctoral study.

TRENDS IN EMPLOYMENT

Though behavioral and social science Ph.D.s are most often employed in academia today, as was the case in the past, increasing numbers are pursuing professional opportunities in other arenas. For the purposes of this analysis, those holding postdoctoral appointments are considered to be in the workforce. As indicated in Figure 3-5, the number of behavioral and social scientists who work in industry or are self-employed has climbed from 2,111 (8.2 percent of the workforce) in 1975 to 11,779 (20.4 percent of the workforce) today. Government employment has also increased, though at a somewhat slower pace. Today, 5,192 behavioral and social science Ph.D.s, or 9 percent of the workforce, are employed in government, up from 1,793 in 1975. During the same period, the number of behavioral and social science Ph.D.s working in academia grew from 18,668 to 34,850. Because positions in academia did not increase as fast as in other sectors, the fraction of the behavioral and social science workforce working in academia declined from 72.4 percent in 1975 to 60.2 percent in 1997.

More recently, however, the number of new positions available in industry appears to be leveling off, and greater numbers of Ph.D.s are once more finding employment in academia. Unlike the 1970s, however, when nearly all academic hiring was for faculty positions, the jobs available in academia today are more evenly split between faculty and nonfaculty appointments (see Figure 3-6). Almost 21 percent of behavioral and social science Ph.D.s employed in academia in 1997 held postdoctoral or "other academic" appointments (i.e., nonfaculty positions as research associates or instructors). Furthermore, faculty appointments today are somewhat less likely to offer tenure. In 1975, 96.1 percent of behavioral and social science faculty were tenured or held tenure-track appointments; the same was true for 88.5 percent of faculty in 1997.

Since the early 1990s, when many new psychology

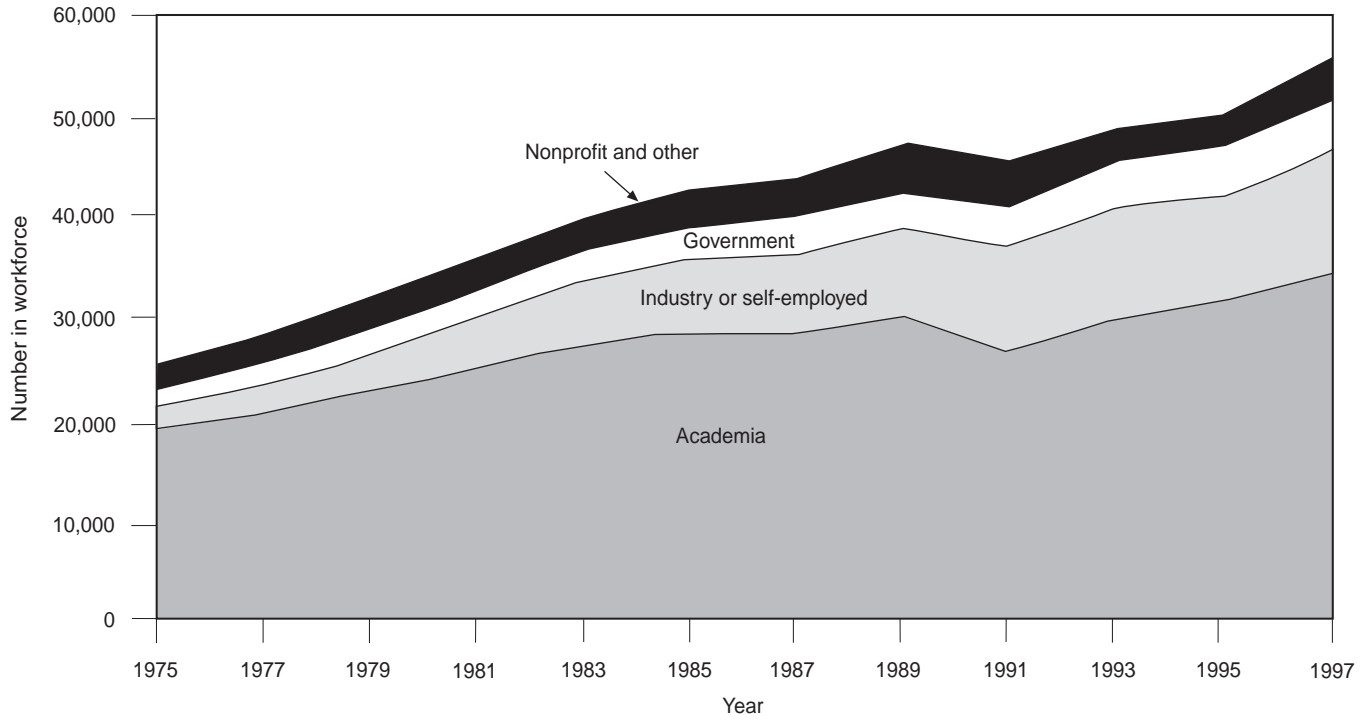


FIGURE 3-5 Employment of behavioral and social scientists by sector. SOURCE: Data are from the Survey of Doctorate Recipients (see Table G-5).

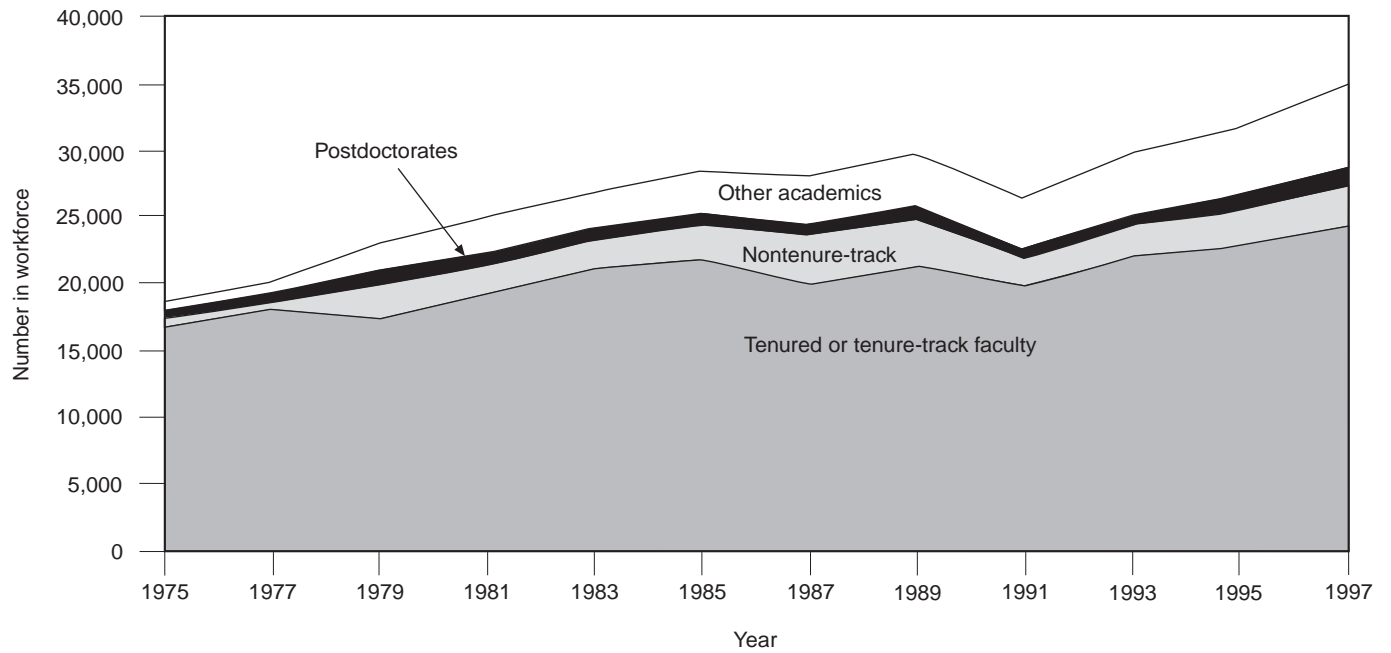


FIGURE 3-6 Employment of behavioral and social scientists in academia. SOURCE: Data are from the Survey of Doctorate Recipients (see Table G-5).

Ph.D.s reported difficulties finding a position, the job market has improved. In 1993 and 1995 only 25 percent of the recent doctoral recipients from the non-clinical specialties of psychology described the job market as “good” or “excellent.”⁶ By 1997 more than 40 percent of new Ph.D.s rated the job market as “good” or better. In addition, departments of psychology have begun to offer faculty appointments to increasing numbers of new Ph.D.s.⁷ For the 1998-1999 academic year, U.S. graduate departments of psychology hired 186 new faculty members trained in non-clinical fields, an increase of almost 45 percent over the previous year.

While encouraging, these improvements in the job market do not necessarily mean that Ph.D. production in the behavioral and social sciences should increase. If the behavioral science workforce were to grow at a rate comparable to that projected for the U.S. workforce as a whole until 2005, the number of new Ph.D.s necessary each year would be slightly less than current levels of Ph.D. production (see Appendix D). Despite the recent upturn in hiring, fewer opportunities for new Ph.D.s to obtain faculty positions are available than a decade ago, when departments of psychology appointed 255 recent doctoral recipients from nonclinical specialties to their faculties.

THE CHANGING ROLE OF THE NATIONAL RESEARCH SERVICE AWARD PROGRAM

In general, the National Research Service Award (NRSA) program plays a smaller role in research training in the behavioral and social sciences than in the basic biomedical fields. Just under 10 percent of U.S. citizens and permanent residents earning behavioral and social science Ph.D.s in 1995 received NRSA funding at some point during their predoctoral study, compared to nearly 35 percent in the basic biomedical sciences.⁸ In part, this is because a great deal of behavioral and social research training is unrelated to health and is

supported by the National Science Foundation rather than the NIH. Funding from NRSA training grants and fellowships is relatively more common for the behavioral and social sciences fields with strong ties to health research. Nearly 30 percent of the 85 eligible Ph.D.s in physiological psychology in 1995 were supported by NRSA funding during their predoctoral studies; the same was true for nearly 25 percent of the 134 eligible degree recipients in developmental and child psychology and more than 70 percent of the seven eligible Ph.D.s in demography.⁹

The most recent assessment of the career outcomes of NRSA predoctoral trainees and fellows in the behavioral and social sciences, conducted in the late 1990s, did not yield results that were as clear-cut as a similar evaluation of NRSA training in the basic biomedical sciences described in Chapter 2. NRSA trainees and fellows, particularly those who received support at the start of graduate school, completed their Ph.D.s faster than other students in the behavioral and social sciences.¹⁰ Yet in subsequent employment and research, no clear differences could be detected between NRSA recipients and other Ph.D.s in these fields. These findings, however, should be interpreted with caution. The information on career outcomes for this evaluation was obtained from sample surveys, and the fraction of NRSA recipients in the behavioral sciences is much smaller than in the biomedical sciences. As a result, the capacity to detect meaningful differences in the career outcomes of behavioral scientists was limited.

Federal support for graduate education in the behavioral and social sciences has followed the same pattern seen in the basic biomedical sciences: declining numbers of students supported by training grants and fellowships, and a steady increase in students working as research assistants. As illustrated in Figure 3-7, nearly four times as many students received their primary support from NIH (or other DHHS) traineeships and fellowships in 1975 as from research grants. Yet today, graduate students employed as research assistants under federal grants outnumber those supported by training grants or fellowships by more than two to one.

A similar though less pronounced reversal has occurred in the federal funding of postdoctoral positions

⁶ Unpublished tabulation from the American Psychological Association, Doctorate Employment Survey; available from the archives of the Academies.

⁷ Unpublished tabulation from the American Psychological Association, Faculty Salary Survey; available from the archives of the Academies.

⁸ Unpublished tabulation from the Survey of Earned Doctorates and NIH Trainee and Fellow File; available from the archives of the Academies.

⁹ Ibid.

¹⁰ Pion, Georgine M. Office of Extramural Research, National Institutes of Health. *The Early Career Progress of NRSA Predoctoral Trainees and Fellows*. Bethesda, Md.: NIH, 2000.

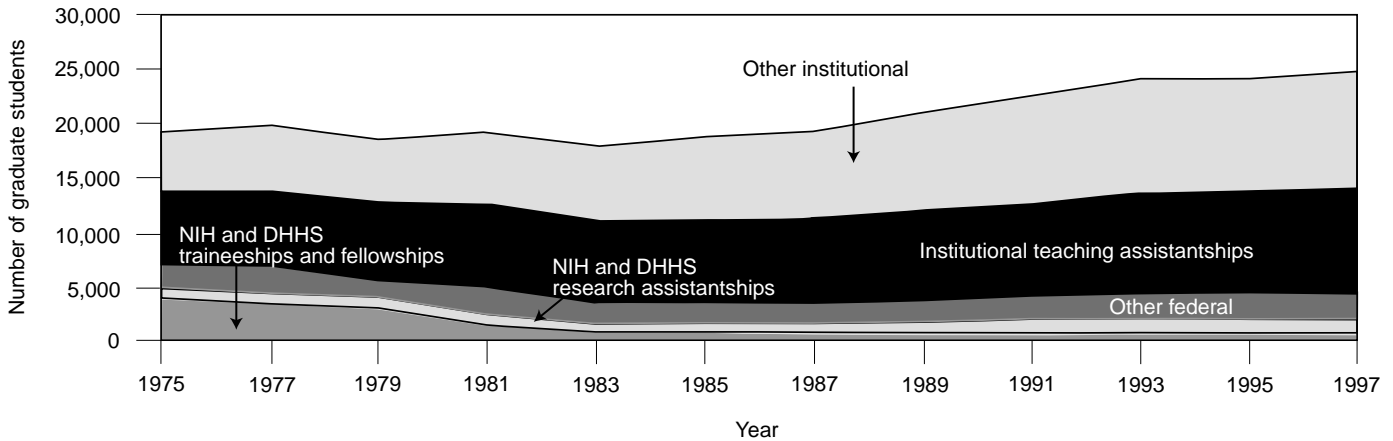


FIGURE 3-7 Trends in graduate students' primary source of support in the behavioral and social sciences. Includes all students at doctorate-granting universities, whether candidates for master's or doctoral degrees, and all subfields of psychology. SOURCE: Data are from the Survey of Graduate Students and Postdoctorates in Science and Engineering (see Table G-8).

in the behavioral and social sciences. In 1975, the majority (53.4 percent) of federally funded postdoctorates in the behavioral and social sciences were supported through training grants or fellowships.¹¹ By 1997, the majority (52.8 percent) were employed on research grants; the share of those with funding from training grants and fellowships had declined to 47.2 percent.

The NIH's efforts to shift research training in the behavioral and social sciences from the predoctoral to the postdoctoral level in the late 1970s and 1980s (described in Chapter 1) account for much of the reduction in training grant and fellowship support for graduate students in these fields. The reason for the concurrent rise in graduate research assistantships is less clear, but may result from a combination of factors. The rising number of graduate research assistants is likely influenced by the funding practices of the NIH, which provides almost \$9,000 more to research assistants and their institutions than to its NRSA trainees or fellows, mostly in the form of indirect cost payments to universities (see Table 2-1). In addition, the reliance on research assistantships has grown in conjunction with the number of graduate students in this country on temporary visas, who are not eligible for NRSA awards. Finally, though the size of the NRSA program has been monitored closely to ensure that the number of trainees

and fellows participating in its programs corresponded to national needs, no similar federal effort has been undertaken to ensure an adequate supply of technically prepared support staff in research, nor is there a system for regulating the number of research assistantships. As a result, Massy and Goldman concluded in their 1995 analysis of science and engineering Ph.D. production that the size of doctoral programs is driven largely by departmental needs for research and teaching assistants, rather than by the labor market for Ph.D.s.¹² Unlike biomedical and clinical research training, which tends to be widely distributed among the NIH institutes, relatively few institutes are responsible for the bulk of the agency's behavioral research training. The National Institute of Mental Health supports the majority of NRSA trainees and fellows in the behavioral and social sciences (55.3 percent in 1997), followed by the National Institute of Child Health and Human Development (13.1 percent), the National Institute on Aging (11.7 percent), the National Institute on Drug Abuse (5.1 percent), and the National Institute on Alcohol Abuse and Alcoholism (4.1 percent).¹³

¹¹ Unpublished tabulation from the Survey of Graduate Students and Postdoctorates in Science and Engineering; available from the archives of the Academies.

¹² Massy, William F., and Charles A. Goldman. *The Production and Utilization of Science and Engineering Doctorates in the United States*. Stanford Institute for Higher Education Research Discussion Paper. Stanford, Calif.: 1995.

¹³ Unpublished tabulation from the Survey of Earned Doctorates and NIH Trainee and Fellow File; available from the archives of the Academies.

For graduate students participating in NRSA programs today, research training in behavioral and social science fields often focuses on a single discipline, such as psychology. In contrast to research training in basic biomedical sciences, where the NIH has mandated that most training grants be multidisciplinary, neither the NIMH nor other institutes active in behavioral research training have required multidisciplinary or interdisciplinary research training.

The predoctoral fellowships offered by the National Institute of Mental Health, National Institute on Drug Abuse, and National Institute on Alcohol Abuse and Alcoholism for M.D.-Ph.D. training might be expected to provide opportunities for interdisciplinary training in behavior and medicine. Yet these fellowships are generally limited to those enrolled in existing M.D.-Ph.D. programs,¹⁴ which typically emphasize basic biomedical training. Consequently, almost all fellows to date have graduated with a Ph.D. in a biomedical discipline, rather than a degree in one of the behavioral or social sciences.¹⁵

Recently, however, several NIH institutes and offices have advocated interdisciplinary research training in the behavioral and social sciences. In reports issued in 1997 and 1998, the NIH-wide Office of Behavioral and Social Science Research and the National Heart, Lung, and Blood Institute recommended more interdisciplinary behavioral research training to foster enhanced communication and collaboration between behavioral, biomedical, and clinical researchers and to encourage such investigators to "become familiar with each others' methods and procedures."¹⁶⁻¹⁷ In early 1999 the National Institute of Mental Health, the National Institute on Aging, the National Institute of Nursing Research, and the NIH Office of Behavioral

and Social Science Research asked the Institute of Medicine to study approaches to interdisciplinary research training in the brain, behavioral, and clinical sciences and to develop recommendations for its expansion; that study is now underway.¹⁸

IMPLICATIONS AND RECOMMENDATIONS

At present, the overall size of the behavioral and social science workforce is sufficient to fill existing national needs, and current levels of research training appear to be adequate to maintain that supply. The extent to which these findings apply to the portion of the behavioral and social science workforce that conducts health research is less clear. No evidence suggests that circumstances differ for those conducting health-related research, but future analyses of this workforce will undoubtedly benefit from a better understanding of the number of behavioral and social science Ph.D.s engaged in health-related research, their training, and career patterns.

In reports issued in 1997 and 1998, the NIH-wide Office of Behavioral and Social Science Research and the National Heart, Lung, and Blood Institute recommended that the agency's research training programs take a more interdisciplinary approach to training in the behavioral and social sciences. Given the extraordinary opportunities for applying advances in the brain sciences and imaging technology to behavioral research and the growing appreciation of the role that behavior plays in clinical medicine and public health today, we strongly support such recommendations. An interdisciplinary approach to research training will undoubtedly benefit young investigators and strengthen behavioral and social sciences research overall. Broader training will provide behavioral and social science investigators with the capacity to work in a greater variety of employment settings and apply their training to a wider range of research problems, including those that require an understanding of neuroscience (and related fields such as pharmacology and biochemistry), clinical medicine, and public health.

Transforming research training in the behavioral and social sciences into a more interdisciplinary activity is likely to be a major undertaking that will require a con-

¹⁴ "Individual Predoctoral National Research Service Awards for M.D.-Ph.D. Fellowships." *NIH Guide for Grants and Contracts*, 20 April 1999. Available: <http://grants.nih.gov/grants/guide/index.html>.

¹⁵ Unpublished tabulation from the Survey of Earned Doctorates and NIH Trainee and Fellow File; available from the archives of the Academies.

¹⁶ National Institutes of Health. National Heart, Lung, and Blood Institute. *Report of the Task Force on Behavioral Research in Cardiovascular, Lung, and Blood Health and Disease*. Bethesda, Md.: NIH, 1998.

¹⁷ National Institutes of Health. Office of Behavioral and Social Sciences Research. *A Strategic Plan for the Office of Behavioral and Social Sciences Research at the National Institutes of Health*. Bethesda, Md.: NIH, 1997.

¹⁸ National Academies. Current Project System. "Building Bridges in the Brain, Behavioral, and Clinical Sciences." Online. Available: <http://www4.nas.edu/cp.nsf>. Accessed 25 August 1999.

certed effort by the NIH and changes in several facets of its research training programs. Rather than suggest a single approach, we recommend that the agency consider the following:

- Gradually shift the focus of its predoctoral programs from single discipline to interdisciplinary training.
- Increase the opportunities for postdoctoral training through interdisciplinary training grants.
- Involve more NIH institutes in behavioral and social science research training, either independently or in joint activities with the institutes that already support the bulk of this training.
- Monitor more closely the implementation of the 1997 policy change for M.D.-Ph.D. programs to ensure that more students are provided opportunities to pursue studies in the behavioral and social sciences related to medicine.

Whatever strategies the NIH chooses, NRSA training mechanisms provide an obvious opportunity for interdisciplinary research training and warrant expansion. Research assistantships, which generally require recipients to focus on a specific research question, are less likely to provide students and postdoctorates with a broad understanding of the interdisciplinary connections between fields. It is unlikely, however, that the NIH could readily return to the pattern of federal research training support that existed in the mid-1970s when the NRSA program was initiated and more than 80 percent of graduate students in the behavioral sciences with NIH or other DHHS support received funding through training grants or fellowships. Instead, the committee believes that the agency should strive for a middle ground: gradually expanding the NRSA program until it accounts for at least 50 percent of the agency's funding for graduate students in the behavioral and social sciences and correspondingly limiting research assistantships and other modes of graduate student support to ensure that overall Ph.D. production does not increase. At the postdoctoral level, the NIH should also seek to provide advanced research training to a greater number of recent Ph.D.s through NRSA training grants and fellowships, rather than postdoctoral appointments on research grants.

Coordinating reciprocal increases in the NRSA program and reductions in other funding for graduate student support will undoubtedly require the NIH to consolidate its oversight of research training and training-related activities. Such a change in NIH policies

and procedures will also have implications for the conduct of research and the ways in which universities administer federal research training funds and will require careful monitoring by the NIH. These and related issues are discussed in greater detail in Chapter 5.

Finally, the NIH should also continue to focus attention on the training of underrepresented minorities in the behavioral and social sciences. The numbers of minority students earning Ph.D.s in the behavioral and social sciences have steadily increased over the last 25 years, but these trends will need further monitoring to ensure that the workforce better reflects the nation's increasing diversity and that the workforce is prepared to address the nation's changing health needs.

Recommendation 3-1. The NIH and the National Science Foundation should take steps to improve data on the behavioral and social sciences workforce, so that those conducting health-related research can be specifically identified in national surveys of the scientific workforce.

Unlike the basic biomedical science workforce, which focuses almost exclusively on health-related research, Ph.D.s trained in the behavioral and social sciences pursue a broader research agenda, much of which is unrelated to health and medicine. At present, investigators trained in health-related research cannot be identified or tracked, which limits any analysis of the nation's needs.

Recommendation 3-2. There should be no growth in the aggregate number of Ph.D.s awarded annually in the behavioral and social sciences.

Given the current employment opportunities for behavioral and social scientists and the continuing growth forecast in the workforce, the present number of approximately 2,600 new behavioral and social science Ph.D.s per year is sufficient to fulfill anticipated national needs in the near future (until at least 2005).

Recommendation 3-3. The NIH should increase its emphasis on interdisciplinary research training in the behavioral and social sciences.

Research training in the behavioral and social sciences related to health should be expanded beyond traditional disciplinary boundaries and provide opportunities for participating students and fellows to

integrate their knowledge of the behavioral and social sciences with advances in the brain sciences (and related fields such as brain imaging, biochemistry, and pharmacology), public health, and medicine.

Transforming research training in the behavioral and social sciences into a more interdisciplinary activity is likely to require a concerted effort by the NIH and changes in several facets of its research training programs. Rather than recommend a single approach, we suggest that the agency consider the following options for achieving this goal:

- Gradually shift the focus of its predoctoral programs from single-discipline to interdisciplinary training.
- Increase the opportunities for postdoctoral training through interdisciplinary training grants.
- Involve more NIH institutes in behavioral and social science research training, either independently or in joint activities with the institutes that already support the bulk of this training.
- Monitor more closely the implementation of the 1997 policy change for M.D.-Ph.D. programs, to ensure that more students are provided opportunities to pursue studies in the behavioral and social sciences related to medicine.

Recommendation 3-4. Support for NRSA training grants and fellowships at the predoctoral and postdoctorals level should be gradually increased. At the predoctoral level, the NIH should seek to provide at least 50 percent of its research training support through training grants and fellowships.

The committee believes that training grants and fellowships are more conducive to interdisciplinary research training and career development than are re-

search assistantships and is concerned by the relative shift away from NRSA training mechanisms toward research assistantships to support students and postdoctorates in the biomedical and behavioral sciences that has occurred since 1975. Therefore, we recommend a gradual expansion in the numbers of students and postdoctorates supported by NRSA training grants and fellowships, but only if accompanied by a change in the pattern of NIH support: more training funded via NRSA mechanisms and less training supported by research grants.

NIH should carefully monitor the effects of this change on the conduct of research and research training and should consider options to assist graduate departments in restricting the expansion of Ph.D. programs, including (1) encouraging universities to provide all entering graduate students with some form of financial support, such as a traineeship, that would allow them an opportunity for broad multidisciplinary education, (2) requiring graduate students to pass qualifying exams before working as research assistants on federally funded projects, and (3) limiting the number of years graduate students and postdoctorates may be employed in temporary appointments with federal funds.

Recommendation 3-5. The NIH should continue its efforts to identify and support programs that encourage and prepare underrepresented minority students for careers in behavioral and social science research.

Although the number of underrepresented minority men and women earning Ph.D.s in the behavioral and social sciences has increased substantially in recent years, the NIH should take steps to ensure that these trends continue and accelerate.