

Crosscutting Issues in Research Training

In addition to reviewing the size of the research workforce in the biomedical, behavioral, and clinical sciences, and assessing the likely needs for future investigators, the committee appraised the effectiveness of the research training activities sponsored by the National Institutes of Health, the Agency for Healthcare Research and Quality, and the Health Resources and Services Administration. Although the preceding chapters examine many of these issues, the committee found that a number of the questions were recurring ones, arising in nearly every field of research training:

- What are the best ways to develop a research workforce that is representative of the nation and fully addresses the population's health needs?
- Would research training be more effective if the NRSA program were better coordinated with other federal funding mechanisms for students and young investigators?
- How should stipend levels and other forms of compensation for those in training be set?
- What role should the National Institutes of Health (NIH) and other federal agencies play in providing research training to students from outside the U.S.?

DEVELOPING A RESEARCH WORKFORCE THAT REFLECTS THE NATION AND ADDRESSES ITS HEALTH NEEDS

Despite enormous advances in the health of Americans during the 20th century, the health status of the nation's minorities at every stage of life is much worse than that of the rest of the population. Research into the reasons for these disparities has generally targeted

factors such as income, education, and occupation and has shown that these factors have a great influence on health. Still, race has been found to have an effect on health independent of socioeconomic status, and those who have studied health disparities find that cultural influences, social factors, and racism all play a role.¹ As the population of the nation grows more diverse, it is crucial that the research workforce increase its focus on those disparities.

Over the past 20 years, the federal government has devoted substantial effort and funds to increasing the representation of minorities in the research workforce. During that time, both the number and the percentage of science Ph.D.s earned by underrepresented minorities have grown (see Tables G-1, G-2, and G-3). The rate of growth has been slow, however, and the percentage of minorities in research remains less than in the health professions and substantially less than in society at large (see Table 5-1).

The situation is much the same for the NIH and its fellow agencies in the Department of Health and Human Services. None of the many initiatives undertaken by these agencies to date—either within or outside the NRSA program—appear to have had a major impact on the diversity of the health research workforce.

A 1993 report on NIH's programs found "a modest effect" on the number of underrepresented minorities among the agency's grant recipients.² That analysis,

¹ Williams, David R., Risa Lavizzo-Mourey, and Rueben C. Warren. "The Concept of Race and Health Status in America." *Public Health Reports* 109 (1994): 26-41.

² National Institutes of Health. Office of Research on Minority Health. *Assessment of NIH Minority Research/Training Programs: Phase 1*. Bethesda, Md.: NIH, 1993.

TABLE 5-1 Racial and Ethnic Distribution of Selected Populations, 1997 (percent)

	African American	Hispanic	Native American	Asian	White
U.S. population ^a	12.1	10.9	0.7	3.6	72.7
Ph.D. recipients in the basic biomedical sciences ^b	2.7	3.4	0.2	18.2	72.9
Ph.D. recipients in the behavioral and social sciences ^b	5.0	4.7	0.7	4.7	78.7
Ph.D. recipients in the clinical sciences	5.1	3.0	0.6	9.7	80.3
NRSA trainees and fellows ^b	6.2	5.1	0.6	17.1	70.9
M.D.-Ph.D. graduates	3.6	4.0	0.6	18.5	72.8
Medical school graduates	7.3	5.9	0.6	15.9	68.1
Dental school graduates	5.4	5.5	0.2	18.2	70.2

^a The resident population of the mainland United States, estimated from the 1990 census.

^b U.S. citizens and permanent residents.

SOURCES: Data on Ph.D.s, NRSA trainees and fellows, and M.D.-Ph.D.s are from the Survey of Earned Doctorates, the NIH IMPAC System, and the Association of American Medical Colleges, respectively. Data on the U.S. population are from the U.S. Census Bureau, Population Estimates Program. Data on medical school graduates are from the Association of American Medical Colleges, *AAMC Data Book*, 1999. Data on dental school graduates are from the American Dental Association, Survey Center, *1997-1998 Survey of Predoctoral Dental Educational Institutions*.

however, studied the combined effects of all NIH programs and was hampered by limited data, which led to recommendations for improved data collection and separate evaluations of each of the agency's major programs. Since then the NIH has completed a follow-up study of undergraduates who participated in the Minority Access to Research Careers (MARC) program, an NRSA initiative and the NIH's largest program devoted to building the diversity of the research workforce.³

Still, like the agency-wide assessment before it, the MARC program evaluation found little change in the number of science Ph.D.s earned by graduates of colleges that received MARC training grants. Nearly half the MARC participants since the program began in 1977 went on to advanced study, but twice as many earned medical or dental degrees as Ph.D.s.

Other NIH programs aimed at increasing the diversity of the research workforce include bridge grants, which link major research universities to colleges with significant minority enrollments⁴ and research supple-

ments for investigators who recruit minority students and fellows to work as research assistants on their projects.⁵ Both initiatives are less than a decade old, however, and their effectiveness has yet to be assessed.

Without information on the relative success of federal programs for increasing the diversity of the research workforce, it is impossible to advocate one approach over another or to determine which program characteristics are the most significant. Nonetheless, several points merit further attention. First, since MARC participants have shown a greater inclination to earn a medical or dental degree than a Ph.D.,⁶ the program's effectiveness might be heightened by further increasing its emphasis on research careers. In addition, because some colleges and universities (the University of Maryland, Baltimore County, for example)⁷ are particularly successful at encouraging minority students to pursue research careers, it would be

³ National Institutes of Health. National Institute of General Medical Sciences. *A Study of the Minority Access to Research Careers Honors Undergraduate Research Training Program*. Bethesda, Md.: NIH, 1995.

⁴ "Initiatives for Minority Students: Bridges to the Future," *NIH Guide for Grants and Contracts*, 24 January 1992. Available: <http://grants.nih.gov/grants/guide/index/html>.

⁵ "Research Supplements for Underrepresented Minorities," *NIH Guide for Grants and Contracts*, 24 January 1992. Available: <http://grants.nih.gov/grants/guide/index.html>.

⁶ National Institutes of Health. National Institute of General Medical Sciences. *A Study of the Minority Access to Research Careers Honors Undergraduate Research Training Program*. Bethesda, Md.: NIH, 1995.

⁷ Maton, Kenneth I., Freeman A. Hrabowski III, and Carol L. Schmitt. "African-American College Students Excelling in the Sciences: College and Post-College Outcomes in the Meyerhoff Scholars Program." *Journal of Research in Science Teaching*, in press.

useful for the NIH to identify the factors common to the most effective MARC programs and ensure that they are replicated wherever possible.

A 1998 revision of the MARC program announcement directed institutions that receive these training grants to establish measurable goals and specific objectives for their programs, monitor their progress, and be prepared to demonstrate the benefits of MARC funding on measures such as student recruitment, retention, and career outcomes.⁸ Whether this policy change will make a difference in the composition of the research workforce is unlikely to be evident for a number of years.

Ultimately, unless larger numbers of minority students enter college prepared to pursue classes in science and math, it is not likely that the MARC program (or any other programs aimed at college or graduate students) will ever have more than a limited effect on the diversity of the research workforce. Though the NIH has not traditionally played a major role in secondary education, its responsibility for ensuring diversity in the research workforce requires that it consider doing so.

Success in college and graduate school science and math generally requires a rigorous high school background.⁹ Science magnet schools often excel in this area, and other approaches have been successful as well. For example, in the New York City public schools involved in the "Gateway to Higher Education" program, participating students take all their classes together, participate in study groups, and have an extended and enriched school day and an 11-month school year. Since the program's inception in 1986, its graduates have completed high school with an average of three advanced placement courses, and 97 percent have gone on to 4-year colleges. By the fourth year of college, 59 percent reported plans for a science-based career, such as medicine, computer science, engineering, or research.¹⁰

⁸ "MARC Undergraduate Student Training in Academic Research (U-STAR) Program," *NIH Guide for Grants and Contracts*, 29 July 1998. Available: [http://grants.nih.gov/grants/guide/index/html](http://grants.nih.gov/grants/guide/index.html).

⁹ Ready, Timothy, and Herbert W. Nickens. Programs That Make a Difference. In *More Minorities in Health*, edited by Barbara H. Kehrler and Hugh Burroughs. Menlo Park, Calif.: The Henry J. Kaiser Foundation, 1994.

¹⁰ Iler, Elisabeth, and Morton Slater. "The Gateway Program: Ten-Year Lessons About Outcomes and Admissions Measures." *Academic Medicine* 73, no. 11 (1998): 1169-71.

Investigators from minority backgrounds will not, of course, necessarily pursue research on health disparities. Nor should it be assumed that only investigators from minority backgrounds can effectively conduct such research. Yet those from minority groups are more likely than others to be aware of the health problems of disadvantaged populations and, if they choose to address such problems in their research, the committee believes that they are likely to do so with great insight, motivation, and persistence.

Many research training programs could do more to ensure that new investigators of all backgrounds recognize the differences in health among racial and ethnic groups and that they are capable of addressing related questions in their research. In this regard, research training might be enhanced by drawing on recent developments in medical education. In addition to actively recruiting minority students, medical schools today are increasingly mindful that all their students must be prepared to treat patients from a wide variety of backgrounds. In fact, such training will become a mandatory component of the medical curriculum before the end of the 1999-2000 academic year, with the adoption of new accreditation standards requiring that medical school faculty and students "demonstrate an understanding of the manner in which people of diverse cultures and belief systems perceive health and illness and respond to various symptoms, diseases, and treatments."¹¹ The 1994 federal requirement that minority groups be adequately represented in clinical studies funded by the NIH and the Agency for Healthcare Research and Quality is another compelling reason for clinical research training programs to prepare trainees and fellows to work with diverse populations of patients.¹²

THE NATIONAL RESEARCH SERVICE AWARD PROGRAM AND OTHER FORMS OF RESEARCH TRAINING SUPPORT

In drafting the NRSA Act of 1974, Congress sought to strengthen the NIH's capacity to conduct research

¹¹ Liaison Committee on Medical Education. "Accreditation Standards: Standards Proposed and Under Consideration." Online. Available: <http://www.lcme.org/standard.htm>. Accessed 8 December 1999.

¹² "NIH Guidelines on the Inclusion of Women and Minorities as Subjects in Clinical Research," *NIH Guide for Grants and Contracts*, 18 March 1994. Available: <http://grants.nih.gov/grants/guide/index.html>.

training by consolidating the agency's existing training activities into a single program. With the passage of this legislation, Congress expected that the NRSA program would become the "major element" of NIH training activities, providing a "consolidated authority in the Office of the Director of the National Institutes of Health [that] would enable resources to be flexibly adjusted each year to respond to the specific needs for the training of biomedical researchers."¹³

In its early years, the NRSA program functioned much as Congress intended, but as other NIH funding mechanisms have come to be more widely employed for training and related activities, the relative influence and effectiveness of the NRSA program have waned. Instead of "the major element" of NIH research training, the NRSA program is now one of a number of such activities that the agency supports. As noted in Chapter 1, the NRSA program provided funding to 14,443 trainees and fellows in 1975, nearly 45 percent more than the NIH supported through graduate research assistantships, postdoctoral research appointments, and career development awards. That balance has long since been reversed: More than 30,000 graduate students, postdoctoral fellows, and young professionals were estimated to be supported by the agency through non-NRSA sources in 1997 (see Table 1-2), almost twice the number of NRSA trainees and fellows. As a result, the NRSA program no longer plays the decisive role it once did in NIH funding for health research training.

As the lead agency for NRSA research training, the NIH actively manages the program, setting policies and procedures, monitoring the number of training grant and fellowship awards, and assessing the career outcomes of its participants. Because the NIH does not oversee non-NRSA training-related awards in a similar fashion, the agency has little control over how many students and young investigators are supported with such funds, the type of training they receive, and the quality of their educational experience.

For some training-related activities, such as career development awards, the NIH establishes general guidelines; each of the agency's institutes determines for itself how many awards it will make, the salary it will pay, and the time commitment expected of its award recipients. For other types of funding, such as

graduate research assistantships, there is less oversight. The NIH restricts the maximum compensation for graduate research assistants but sets few other guidelines. Furthermore, neither the agency nor its institutes limit the number of assistantships available. In fact, because the information management system shared by the NIH and the Agency for Healthcare Research and Quality is not set up to collect information on graduate research assistants—or, for that matter, postdoctoral research support personnel—the two agencies cannot determine the number of assistantships they provide. (The figures cited in this report and employed by the agencies are drawn from university reports of the numbers of graduate students and postdoctorates and their primary sources of support.)

With its range of funding mechanisms and uneven oversight, the current system of research training in the biomedical and behavioral sciences is far from being the consolidated flexible program that Congress envisioned. Our committee believes that research training in the health sciences is unlikely to meet national needs unless it is subject to greater oversight, consolidation, and control. Accomplishing this goal need not entail new legislation or a new research training program, but would require the NIH and other agencies to track training-related activities outside the NRSA program to manage the overall number of individuals trained in each field in response to research needs, and to coordinate a wider range of policies and procedures.

To better manage research training, the NIH, the Agency for Healthcare Quality and Research, and the Health Resources and Services Administration will require more detailed data on the research training activities they support. In particular, these agencies need better information on the number, characteristics, and compensation of students and postdoctorates supported by their research funds (including those working on the NIH campus), as well as on the training and research careers of physicians, dentists, and other health care professionals. Though data on NRSA participants are relatively complete, their fields of training are not consistently and accurately recorded, a gap in information that limits the agencies' ability to direct research training to areas of need.

Our committee was pleased to learn that the NIH is developing a new management information system (IMPAC II) and hopes the agency will take this opportunity to work with the Agency for Healthcare Research and Quality and the Health Resources and Services Administration to improve reporting on all research

¹³ U.S. Congress. Senate Committee on Labor and Public Welfare. *National Research Service Award Act of 1974*. 93rd Cong., 1st sess., 1973. S. Rept. 93-381.

training and training-related activities, including fields of study. Future analyses of the research workforce would also be facilitated if the NIH's new management information system were routinely linked with other sources of data on the research workforce, such as the Doctorate Records File of Ph.D. recipients, the CRISP database of federally funded biomedical research projects, the Association of American Medical Colleges' Faculty Roster System, and the American Medical Association's Physician Masterfile.

In addition to improvements in data collection and analysis, the NIH, the Agency for Healthcare Research and Quality, and the Health Resources and Services Administration must pay additional attention to managing and coordinating their research training and related activities. Rather than relying solely on committees such as ours, which meet only periodically, the agencies should work together to bolster their capacity to analyze labor market trends on a continuing basis and to use these analyses to regulate the size and focus of their research training activities. Both research training and related activities should be guided by an explicit statement of educational philosophy, and the agencies should work together to coordinate policies and procedures, including those concerning stipends and eligibility for training, two issues that are discussed in greater detail below.

SETTING STIPENDS AND OTHER COMPENSATION

While pursuing NRSA research training, participating students and fellows receive stipends to help defray their living expenses. As shown in Table 5-2, stipend levels are determined by education and experience and rise as a student progresses from college to graduate school to postdoctoral training. At the postdoctoral level, stipends increase with every year of experience beyond the doctoral degree.

In contrast to NRSA participants, graduate students and postdoctorates who work as research assistants on federally funded research projects or on the NIH campus are regarded as employees. For part- or full-time work, these students and fellows receive salaries and other benefits, such as health insurance and tuition waivers. Compensation for these workers usually reflects their education and experience, but exceptions are frequently made. For example, NIH policy permits universities to compensate graduate student research assistants at the same level as first-year postdoctoral

TABLE 5-2 NRSA Stipends, Fiscal Year 1999

Status	Stipend (in dollars)
Undergraduate students	
Freshmen/sophomores	6,780
Juniors/seniors	9,492
Graduate students	14,688
Postdoctorates (by years of experience)	
0	26,256
1	27,720
2	32,700
3	34,368
4	36,036
5	37,680
6	39,348
7 or more	41,268

SOURCE: "National Research Service Award (NRSA) Stipend Increase," *NIH Guide for Grants and Contracts*, 20 November 1998.

employees, as long as their total compensation (the combination of salary, tuition remission, and benefits) does not exceed \$26,000.¹⁴

Though not every university provides the \$26,000 maximum, compensation for graduate research assistants commonly exceeds the stipends and benefits provided to graduate students in NRSA training (see Table 2-1). For senior graduate students working on their dissertations, a higher level of compensation may well be appropriate to their advanced training and experience. Yet almost all universities also appoint first-year graduate students to research assistantships, a practice that can create disparities among entering students unless the institution subsidizes NRSA stipends to ensure that all students are compensated equally.

At the postdoctoral level, universities often synchronize salary levels with the NRSA stipend scale to ensure that postdoctoral fellows are treated equally throughout the institution. However, salaries for postdoctorates working on the NIH campus have routinely exceeded NRSA stipend levels, a discrepancy

¹⁴"Graduate Student Compensation," *NIH Guide for Grants and Contracts*, 2 December 1998. Available: <http://grants.nih.gov/grants/guide/index.html>.

that elicited complaints from university-based postdoctoral fellows. (Much of that disparity disappeared in 1998, when NRSA stipends increased approximately 25 percent.¹⁵)

Because career development awards were originally designed for faculty members, salaries for these awards are higher than those granted to postdoctorates. Within limits set by each NIH institute, award recipients are compensated according to the salaries paid by their universities and research institutes. As a result, career development awards are the only training-related grants that recognize income differences among fields. Because of this flexibility, NIH staff have increasingly turned to career development awards in recent years as a means for providing research training to those in highly compensated fields such as bioinformatics and medicine.

By design, the NRSA program makes no distinctions between the stipends offered to M.D.s and Ph.D.s. When Congress established the program, its members were troubled by the then-common practice of providing higher stipends to M.D.s in research training than to Ph.D.s—especially since many physicians who undertook research training during that era did not eventually pursue research or academic careers. Thus, in establishing the NRSA program, Congress directed its administrators to eliminate the discrepancy between stipends provided to M.D.s and Ph.D.s.¹⁶ Consequently, stipends for NRSA participants have always been determined by a single stipend scale.

While it is unlikely that the compensation and benefits that students and postdoctorates receive from various federal funding mechanisms can ever be completely standardized, NIH and its fellow agencies could do more to make their policies and practices consistent. The emphasis on education and experience that governs NRSA stipend levels should be applied to all training-related activities.

If, for example, the NIH believes that advanced graduate students should be compensated at higher levels than those just beginning their studies, that policy should apply throughout its training-related activities. Similarly, if the compensation for young professionals

receiving career development awards recognizes salary differences among fields, the committee believes that the NIH and its fellow agencies should adopt the same approach for those in research training or training-related pursuits after the second or third postdoctoral year, when Ph.D.s have generally completed a postdoctoral fellowship and most M.D.s have completed their residency training.

On a related note, the committee was troubled that, although career development awards routinely cover family health insurance, the NRSA program provides only individual health insurance to participating graduate students and postdoctorates. The committee believes that the NIH, the Agency for Healthcare Research and Quality, and the Health Resources and Services Administration should require that family health insurance be provided to all eligible NRSA participants.

Finally, just as the NIH and the Agency for Healthcare Research and Quality research budgets are routinely adjusted every year for inflation, the same practice should be applied to the NRSA program and other training-related award mechanisms. Typically, NRSA stipends have been modified on an ad hoc basis, when the NIH budget permitted, and have not always kept up with inflation (see Figure 5-1). Moreover, because the higher levels apply only to training grants and fellowships awarded after the new stipend scale is in place, these intermittent adjustments can create significant discrepancies in the stipends paid to NRSA participants and between NRSA training programs and other training-related activities. The NIH, the Agency for Healthcare Quality and Research, and the Health Resources and Services Administration could do much to reduce these disparities if they modified their budgets annually to allow for increases in stipends, salaries, and other training-related costs and regularly adjusted compensation limits for career development awards.

THE TRAINING OF FOREIGN STUDENTS AND FELLOWS

Over the last few decades, steadily increasing numbers of foreign students and postdoctorates have sought research training in the health sciences at U.S. universities, medical centers, and research institutes. This trend has been most pronounced in the basic biomedical and clinical sciences but has been evident in the behavioral and social sciences as well (see Table 5-3). In the basic biomedical sciences, temporary-visa hold-

¹⁵ "National Research Service Award (NRSA) Stipend Increase," *NIH Guide for Grants and Contracts*, 19 November 1998. Available at <http://grants.nih.gov/grants/guide/index.html>.

¹⁶ U.S. Congress. Senate Committee on Labor and Public Welfare. *National Research Service Award Act of 1974*. 93rd Cong., 1st sess., 1973. S. Rept. 93-381.

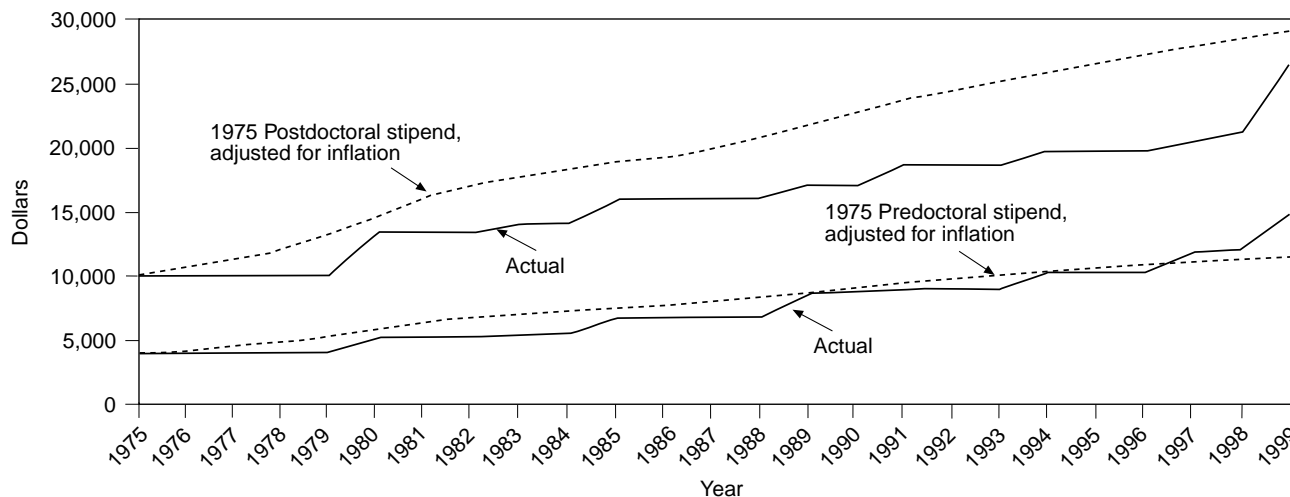


FIGURE 5-1 NRSA stipends for graduate students and first-year postdoctorates, actual and adjusted for inflation. SOURCE: Data are from the NIH Office of Extramural Research; adjustments were made using the Consumer Price Index.

ers account for more than 40 percent of the increase in the total number of Ph.D.s awarded since 1975.

Moreover, many of these temporary-visa holders who earn a Ph.D. in the U.S. remain in the country after completing their studies. After reviewing records from the Social Security Administration, one researcher found that 57 percent of Ph.D. recipients in the life sciences and 26 percent of Ph.D.s in the social sciences were still in the U.S. two years after receiving their doctorates.¹⁷ Trends in the citizenship of postdoctoral fellows have not been tracked as long as for Ph.D. recipients, but from 1979 to 1997 the numbers of

postdoctorates from other countries in the U.S. more than quadrupled in the biomedical and clinical sciences and more than tripled in the behavioral and social sciences. Altogether, biomedical, behavioral, and clinical departments of U.S. universities, medical schools, and research institutes reported hosting more than 12,500 foreign doctorates for training and employment in 1997—nearly 50 percent of postdoctorates in these three fields.¹⁸

Eligibility restrictions for most federal research training programs limit participation to U.S. citizens and permanent residents. As a result, NIH financial

¹⁷ Finn, Michael G. "Stay Rates of Foreign Doctorate Recipients from U.S. Universities, 1995." Oak Ridge, Tenn.: Oak Ridge Institute for Science and Education, 1997.

¹⁸ Unpublished tabulation from the Survey of Graduate Students and Postdoctorates in Science and Engineering; on file in the archives of the Academies.

TABLE 5-3 Ph.D.s Awarded to Temporary-Visa Holders

	1975			1997		
	No. of Temp.- Visa Holders	Total Ph.D.s	Percent	No. of Temp.- Visa Holders	Total Ph.D.s	Percent
Basic biomedical sciences	256	3,085	8.3	1,170	5,420	21.6
Behavioral and social sciences	190	2,794	6.8	253	2,591	9.8
Clinical sciences	21	230	9.1	247	1,349	18.3

SOURCE: Data are from the Survey of Earned Doctorates (see Tables G-1, G-2, and G-3).

support for foreign graduate students and postdoctorates is difficult to track, as their salaries and tuition benefits are most often included in budget lines for “research assistants” rather than for “training.” The committee heard concerns that foreign graduate students and postdoctorates are seen by some American institutions as low-wage laboratory workers, rather than as young scientists undergoing intensive research training. Indeed, a number of American universities actively recruit foreign students for such purposes.¹⁹ Such practices were defended by some on grounds of insufficient numbers of American-born and -educated biomedical scientists available to serve in research support roles.

Policies regarding the support of foreign students and postdoctorates vary considerably between the NRSA program and the other training-related activities of the NIH and AHRQ. For example, tuition waivers and other research training opportunities are available to graduate students and postdoctorates from anywhere in the world through federally-funded research projects at U.S. universities. At the same time, however, participation in NRSA training grants and fellowships is limited to U.S. citizens and permanent residents. The rationale for having these two different policies is not clear to the committee. If, for example, the reason for supporting foreign students and scientists on research grants is a rising demand for support staff to carry out research, rather than demand for principal investigators (as several recent reports have suggested),²⁰⁻²² federal policy-makers should turn their attention to developing a long-term solution to this need.

Federal officials should also review situations in which U.S. funds might reasonably be used to support the graduate education and postdoctoral research training of foreign citizens. The committee believes that federal funding of the educational expenses of foreign

students and postdoctoral fellows should focus on foreign assistance programs intended to improve the scientific and technical personnel of developing countries and formal exchange programs, such as those currently sponsored by the NIH's Fogarty International Center. Whatever the final determinations of federal policymakers, the goal of federal funding for the education of foreign students and postdoctorates should be clearly articulated and funding should be tracked and managed to meet those objectives.

IMPLICATIONS AND RECOMMENDATIONS

When Congress established the NRSA program, it did so with the expectation that health research would benefit from a consolidated flexible program of research training. Yet over the years the NRSA program has had difficulty accommodating its system of predoctoral and postdoctoral training grants and fellowships to such challenges as the nation's increasing diversity, the growing demand for research support personnel, and the mounting indebtedness of health care professionals. As a result, research administrators and investigators have increasingly turned to funding mechanisms outside the NRSA program: research grant supplements and bridge grants for the training of underrepresented minorities, graduate research assistantships and postdoctoral appointments to fill the needs for research support staff, and career development awards for clinical investigator training.

These funding mechanisms appear to have filled some gaps in research training that the NRSA program was slow or unable to address. Even so, the resulting research workforce will not meet the nation's needs for health research unless these alternative funding mechanisms are thoughtfully coordinated with NRSA training grants and fellowships.

Recommendation 5-1. Led by NIH, the agencies with responsibility for health research training should strengthen their efforts to ensure diversity in the research workforce.

The NIH, the Agency for Healthcare Research and Quality, and the Health Resources and Services Administration should continue to evaluate existing programs intended to increase the diversity of the research workforce and redirect their funds, when appropriate, to programs and activities that have a measurable effect on diversity. The committee urges the agencies to focus their attention on improve-

¹⁹ Burgess, David R. “Barriers to Graduate School for Minority-Group Students.” *Chronicle of Higher Education* 44, no. 7 (10 October 1997): B7-8.

²⁰ 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.

²¹ National Research Council. *Trends in the Early Careers of Life Scientists*. Washington, D.C.: National Academy Press, 1998.

²² Marincola, Elizabeth, and Frank Solomon. “The Career Structure in Biomedical Research: Implications for Training and Trainees.” The American Society for Cell Biology Survey on the State of the Profession. *Molecular Biology of the Cell* 9 (November 1998), 3003-6.

ments in opportunities for minorities at the secondary school level (or earlier), seeking legislative authority to do so, if necessary. Though these agencies have not traditionally played much of a role in secondary education, we believe that their responsibility for ensuring diversity in the research workforce necessitates that they do so.

Recommendation 5-2. The NIH, the Agency for Healthcare Research and Quality, and the Health Resources and Services Administration should encourage research training programs to expose participants of all backgrounds to issues associated with economic, cultural, racial, and ethnic disparities in health.

While members of minority groups underrepresented in science may be more likely than others to be aware of the health problems of disadvantaged populations, they cannot and should not be expected to shoulder the responsibility for addressing the nation's needs for research in this arena. Research training should do more to ensure that greater numbers of investigators of all backgrounds are conscious of the differences in health among racial and ethnic groups and are capable of addressing related questions in their research.

Recommendation 5-3. The NIH, the Agency for Healthcare Research and Quality, and the Health Resources and Services Administration should consolidate their oversight of research training and training-related activities and thereby shape and manage the workforce as envisioned by Congress when it established the NRSA program.

We believe—just as Congress did when it authorized the NRSA program—that research training will be strengthened by more comprehensive oversight, consolidation, and control. In particular, there is a clear need for the NIH and the other agencies involved in the NRSA program to enhance their capacities to conduct regular analyses of labor market conditions affecting the research workforce.

Recommendation 5-4. Stipends and other forms of compensation for those in training should be based

on education and experience and should be regularly adjusted to reflect changes in the cost of living.

While it is unlikely that the compensation and benefits that students and postdoctorates receive from various federal funding mechanisms can ever be completely standardized, the NIH, the Agency for Healthcare Research and Quality, and the Health Resources and Services Administration can do more to make their policies and practices consistent. The committee believes that the criteria of education and experience that determine NRSA stipend levels should guide compensation levels for training-related activities outside the NRSA program as well.

The committee welcomes the recent increases in NRSA stipends, yet notes that even the new stipend levels remain unduly low in view of the high levels of education and professional skills involved. The committee urges that automatic cost-of-living adjustments using appropriate indices be incorporated into budget planning, so that stipends are not again allowed to decline in real value.

Recommendation 5-5. The NIH and other federal science agencies that support research training should articulate clear goals regarding the education of foreign scientists and should modify their grants policies where necessary.

Policies regarding the support of foreign students and postdoctorates vary considerably between the NRSA program and the other training-related activities of the NIH and AHRQ. For example, tuition waivers and other research training opportunities are available to graduate students and postdoctorates from anywhere in the world through federally-funded research projects at U.S. universities. At the same time, however, participation in NRSA training grants and fellowships is limited to U.S. citizens and permanent residents. The rationale for having these two different policies is not clear to the committee. Federal goals for financing the education of foreign scientists should be more clearly defined and funding should be actively managed to meet those objectives.