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The NIH Intramural Research Loan Repayment Program: Synthesis of Findings from Process and Outcomes Analyses

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This synthesis summarizes two comprehensive reports, one by Humphrey and Silva (2004) and one by Glazerman and Seftor (2005) on the process analysis and outcomes analysis, respectively, of the NIH Intramural Loan Repayment Program. The authors of those reports received assistance from several people at the NIH and at Mathematica Policy Research, all of whom are acknowledged more fully in each report. Here, we would like to reiterate our thanks, especially to current and former staff of the NIH Office of Loan Repayment and Scholarship (OLRS), Dr. Alfred Johnson, David Conboy, and Marc Horowitz. We also want to acknowledge the critical roles played by the study's survey director, Nancy Carey, as well as by Paul Decker, who read and provided comments on drafts of each report. This synthesis report was edited by Carol Soble and prepared for publication by Donna Dorsey.

THE NIH INTRAMURAL RESEARCH LOAN REPAYMENT PROGRAM: SYNTHESIS OF FINDINGS FROM PROCESS AND OUTCOMES ANALYSES

The mission of the National Institutes of Health (NIH) is to acquire new knowledge in order to prevent, diagnose, and treat disease and disability. As part of that mission, the NIH operates an Intramural Research Program (IRP) that brings together researchers in a set of laboratories and clinics run directly by the Institutes and Centers that make up the NIH. Though representing only about 10 percent of the NIH budget, the IRP accounts for more than 2,000 projects conducted mainly in laboratories and clinical research facilities on the NIH's Bethesda, Maryland, campus. The success of the IRP depends on the NIH's ability to attract and retain first-rate biomedical scientists.

Biomedical scientists at the NIH conduct research in most of its 27 relatively autonomous Institutes and Centers (ICs), each consisting of laboratories that are themselves independent. For this reason, ICs and their laboratories enjoy wide latitude with regard to staffing decisions, leaving few opportunities for implementing recruitment and retention policies across all ICs. One exception, however, is a set of intramural loan repayment programs administered by the Office of Loan Repayment and Scholarship (OLRS) within the Office of the Director of the NIH. This report synthesizes the results of an evaluation of intramural loan repayment programs conducted by Mathematica Policy Research, Inc. (MPR), under contract to OLRS. Below, we present more information about the program, the evaluation, and the study's findings.

Loan Repayment for Intramural NIH Researchers

OLRS administers a loan repayment program for research on HIV/AIDS, one for clinical research conducted by biomedical scientists from disadvantaged backgrounds, and two for general research targeted to medical doctors and fellows. These loan repayment programs, referred to collectively as the NIH intramural Loan Repayment Program (LRP), increase the value of total compensation for eligible new NIH scientists by reducing their education-related debt. Such an increase in compensation allows the NIH to be more competitive in attracting and retaining high-quality biomedical researchers relative to academia and private industry, where salaries and other forms of compensation (such as stock options and bonuses) typically are higher than in government (Park 2001).

The LRP consists of the following four programs:

- The AIDS Research LRP (**AIDS LRP**) was created in 1989 to encourage HIV/AIDS research.
- The Clinical Research LRP for Individuals from Disadvantaged Backgrounds (**Clinical LRP**) was added in 1994 to encourage individuals from economically disadvantaged backgrounds to pursue careers in clinical research.

- The General Research LRP (**General LRP**), which began in 1996, is for individuals interested in basic science or clinical research, with priority given to more senior researchers.
- The General Research LRP for Accreditation Council for Graduate Medical Education Fellows (**ACGME LRP**) began as a pilot program in 2001 and is available to fellows in 19 subspecialty and residency training programs for physicians.

All of the programs repay participants' qualified education debts in exchange for a commitment to work at the NIH for a specified length of time. AIDS LRP and Clinical LRP participants commit to two years while General LRP and ACGME LRP participants commit to three years. Participants may apply for one-year extensions to their loan repayment contract to continue repaying outstanding loans. The AIDS, Clinical, and General LRPs provide up to \$35,000 per year in loan repayments; the ACGME LRP, capped at \$5,000 per year until recently, currently provides each participant with up to \$20,000 per year.

To participate in any of the four programs, individuals must be employed in full-time equivalent (FTE) positions, must be citizens or permanent residents of the United States, and must have large educational loans relative to salary. The minimum debt-to-salary ratio for program eligibility is 20 percent. Furthermore, candidates must hold a doctoral degree or equivalent from an accredited institution. Some nurses with less than a doctoral degree are also eligible to participate. Loan repayments are based on the proportion of a participant's qualifying debt relative to the participant's beginning NIH salary.

The Loan Repayment Committee, which consists of senior intramural scientists, including basic and clinical researchers and science policy administrators, reviews applications to the LRP. The committee scores the applications, with initial and renewal applications competing separately. An LRP contract is executed when the candidate accepts an offer of NIH employment or continued employment for the period of the LRP contract. The ACGME LRP relies on an expedited review process in which applications undergo review by a more decentralized and informal group of reviewers.

Participants failing to complete the minimum contract requirements are penalized by varying dollar amounts depending on the point at which they breach their contract. A participant may avoid penalties in the case of termination of employment for cause or convenience or when a participant's research area changes and is no longer eligible for funding. In addition, participants who receive renewal funding and do not complete the one-year period are not penalized.

The Mathematica Evaluation

To respond to the need for information on how the LRP operates and whether it is achieving its goals, OLRS contracted with MPR to design and conduct a comprehensive evaluation of the program. After working with OLRS on a study design, MPR conducted two distinct but complementary studies: a primarily qualitative process study (reported in Humphrey and Silva 2004) and a quantitative study of the career outcomes of participants and nonparticipants (reported in Glazerman and Seftor 2005). This report synthesizes the findings from both reports.

The process report examined data on LRP funding and participant characteristics and explored the program's role in the recruitment and retention of scientists at the NIH. Information sources for the process analysis included OLRS administrative data, a review of program documents, a brief literature review, interviews with seven NIH staff involved in recruitment, and three focus groups conducted with 19 LRP participants during October 2003.

The outcomes report measured recruiting, retention, and other career outcomes for the approximately 400 LRP participants since 1989 and a selected group of more than 600 IRP researchers who did not participate in the program. The nonparticipant sample was drawn by matching participants with a list of IRP researchers who were hired in the same ICs in the same years with the same job titles. It drew mainly on two surveys, a recruiter survey and a retention survey.

The recruiter survey was a self-administered questionnaire given to the directors of all 43 NIH fellowship programs for physicians as a way to gauge their experiences with loan repayment as a means of attracting candidates to their programs. We asked about the most recent cohort of candidates, including the number of candidates who were likely to be eligible for loan repayment and who accepted a fellowship offer. We followed up by telephone with program directors who initially did not respond, bringing the overall response rate up to 82 percent.

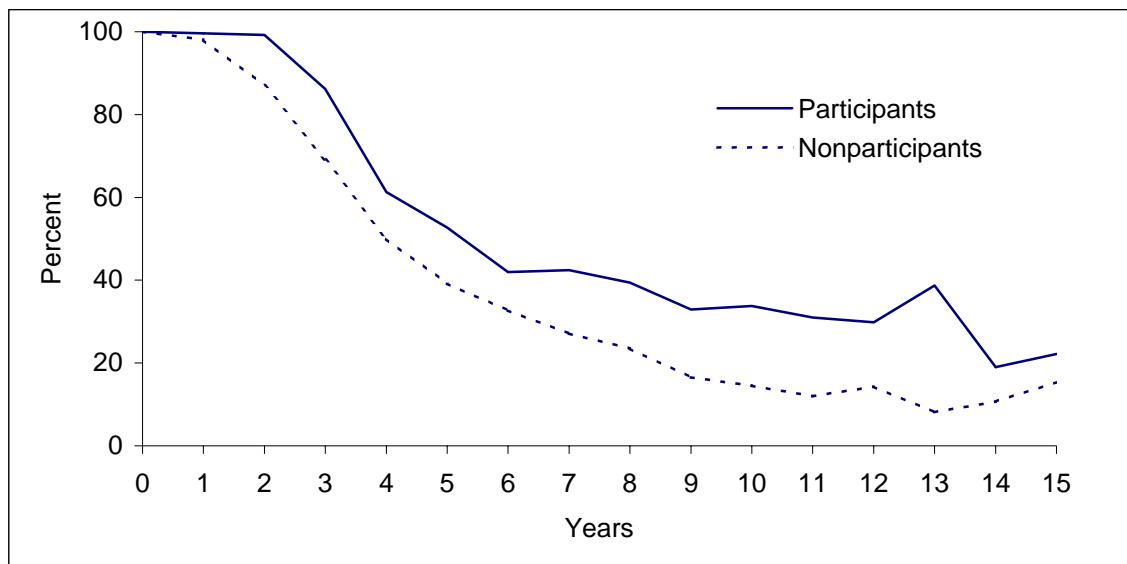
The retention survey (Career Survey of Biomedical Scientists, or CSBS) targeted the universe of current and former LRP participants involved in the IRP since 1989 and a matched group of 645 nonparticipants. The web-based questionnaire (also with telephone follow-up and a paper/pencil completion option) asked about respondents' demographic and educational background, experiences with the NIH, postdoctoral job histories, and other career outcomes. The overall response rate was 74 percent.

Overview of the Findings

Most of the career outcomes subject to examination appeared positive for participants and greater than those of similar nonparticipants. We found that LRP eligibility is associated with a higher success rate in recruiting desirable candidates into medical fellowship programs and that LRP participants had rates of retention in research positions at the NIH and beyond the NIH that were higher than those for similar nonparticipants, at least in the short term (see Figures 1 and 2). While longer-term outcomes are more difficult to measure and require heavy reliance on the experiences of the program's first participants, evidence from the early cohorts shows considerably higher retention rates for participants than nonparticipants in terms of NIH employment and research in general. We did not find the same trend for AIDS research or clinical research per se, but the samples available for the relevant analyses were far too small to draw strong inferences about long-term outcomes. The predicted durations in careers at the NIH, in AIDS research, in clinical research, and in research more generally were significantly higher for participants than for nonparticipants.

Nonparticipants had stronger track records than participants in terms of achieving research tenure and publishing in peer-reviewed scientific journals and books, but such differences disappeared and in some cases reversed when we adjusted for the researchers' age, time out of graduate school, and other factors.

Figure 1. NIH Retention Over Time



Year Since Starting in the IRP	Participants	Nonparticipants	Difference	Adjusted Difference	Sample Size
1	99.6	98.1	1.6*	0.6	620
2	99.2	87.0	12.2***	12.9***	612
3	86.2	69.1	17.1***	23.2***	565
4	61.3	50.0	11.3**	17.8***	499
5	52.7	39.2	13.5***	22.8***	455
6	42.0	32.7	9.3*	14.4**	397
7	42.4	27.1	15.3***	17.2***	350
8	39.4	23.5	15.9***	16.9***	308
9	32.9	16.5	16.5***	8.6	255
10	33.8	14.5	19.3***	15.7**	206
11	31.0	12.0	19.1***	14.8*	175
12	29.8	14.3	15.5**	15.2	131
13	38.7	8.1	30.6***	29.9**	93
14	19.0	10.7	8.3	4.2	49
15	22.2	15.4	6.8	n.a.	22

Source: Data from the Career Survey of Biomedical Scientists.

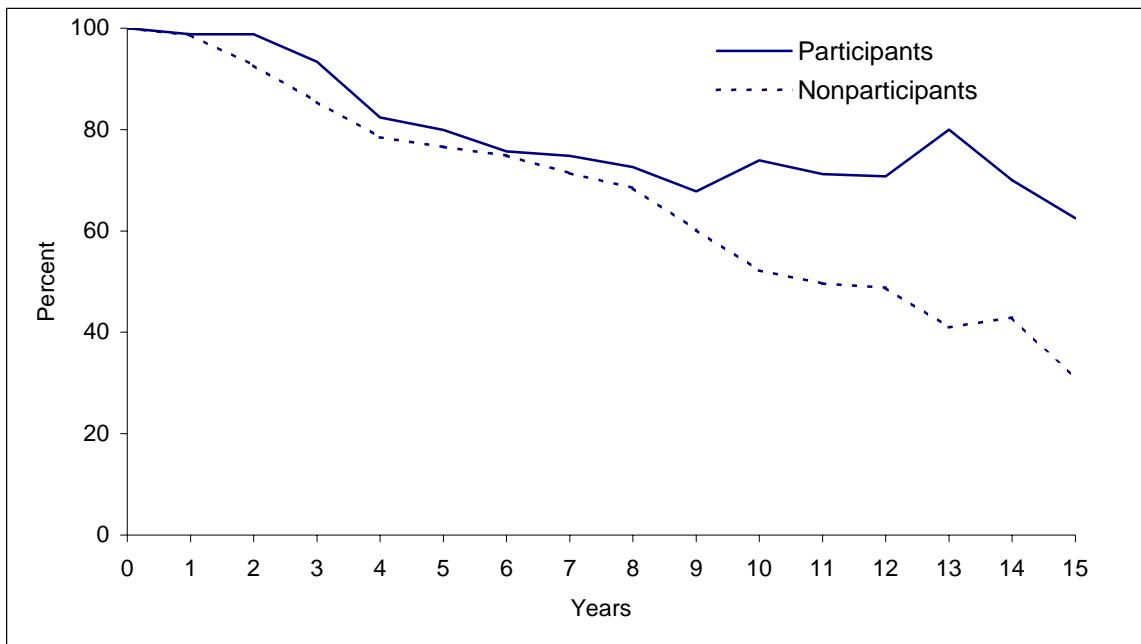
Note: Background variables used to adjust differences include year entered the IRP, age, gender, race/ethnicity, country or region of residence, degree received, Institute or Center, and job title.

*Significantly different from zero at the .10 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

Figure 2. General Research Retention Over Time



Year Since Starting in the IRP	Participants	Nonparticipants	Difference	Adjusted Difference	Sample Size
1	98.8	98.6	0.3	-0.2	602
2	98.8	92.7	6.2***	6.2***	595
3	93.4	85.5	7.9***	11.5***	552
4	82.4	78.5	4.0	7.6*	490
5	79.9	76.6	3.3	6.3	446
6	75.7	74.9	0.8	7.0	395
7	74.8	71.4	3.4	7.0	347
8	72.6	68.5	4.1	8.2	306
9	67.8	60.2	7.6	5.6	253
10	73.9	52.2	21.7***	21.4***	203
11	71.2	49.6	21.6***	15.6*	172
12	70.8	48.8	22.1**	18.6	130
13	80.0	41.0	39.0***	36.6***	91
14	70.0	42.9	27.1*	2.0	48
15	62.5	30.8	31.7	n.a.	21

Source: Data from the Career Survey of Biomedical Scientists.

Note: Background variables used to adjust differences include year entered the IRP, age, gender, race/ethnicity, country or region of residence, degree received, Institute or Center, and job title.

*Significantly different from zero at the .10 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

*** Significantly different from zero at the .01 level, two-tailed test.

From our focus groups with participants and interviews with program operators, we learned that some factors constrain the ability of the LRP to produce impacts on recruiting and retention. Most notably, many stakeholders remarked that prospective researchers often do not learn about the program and thus cannot know for certain whether they will even receive LRP funding until *after* they decide to come to the NIH; as a result, recruitment incentives may be weakened. We also learned that retention at the NIH is a difficult outcome because opportunities for advancement in the intramural program are particularly limited, especially in more recent years.

While the overall findings appear generally positive, it is important to note the study's limitations. The process analysis was limited to 19 focus group participants and was not meant to be representative of all LRP participants. In particular, we met with more recent participants and current NIH employees; therefore, our findings did not represent NIH leavers or early cohorts of participants. The outcomes analysis involved three chief limitations. First, the research design was quasi-experimental, meaning that we compared groups of participants and nonparticipants that were as similar as possible, but we did not have the assurance of a true experiment that would have randomly assigned people to participate or not participate. Therefore, it is possible that the two groups differed in unobservable ways, such as in motivation or abilities. Second, the surveys were retrospective and thus required respondents to recall past events, particularly events in the distant past in the case of some CSBS respondents. Third, despite our high survey response rates, findings for respondents may not generalize to the full population, or slight differences in the response rates between participants and nonparticipants (78 versus 72 percent) could bias the comparisons.

Despite these limitations, many of the findings pointed in the same direction. This evaluation of the LRP presents new information and the best evidence to date on the important questions raised by OLRS and its stakeholders. Below, we present some detail on who participates in the program and how the program may have affected recruitment and retention.

Who Participates in the LRP?

Participation levels in the four LRPs varied from the time of the programs' founding until 2003 when we analyzed OLRS administrative data. During that time, the LRP served 534 participants: 193 in the General LRP, 158 in the AIDS LRP, 83 in the Clinical LRP, and 100 in the ACGME LRP. Although the ACGME LRP is the newest program, it grew rapidly and accounted for far more active participants in 2003 than either the AIDS or Clinical LRPs. The number of active participants in the AIDS LRP declined steadily since 1993 while the Clinical LRP remained at the roughly same level since 1996, its third year. The General LRP grew steadily from its inception in 1994 and had roughly the same number of active participants since 1999.

LRP participants have worked in 20 ICs. The National Cancer Institute (NCI) has claimed the greatest share of participants, almost 35 percent overall, probably reflecting the fact that NCI operates the largest intramural research program. NCI has hosted a plurality of participants in the Clinical, General, and ACGME LRPs. The National Institute of Allergy and Infectious Diseases has hosted a plurality of AIDS LRP participants. Occasionally, participants switch ICs, most notably when they renew their funding; renewal is not especially common. While the vast majority of LRP participants (71 percent) signed only one LRP contract, nearly one-quarter of participants (22 percent) renewed their contract once, and a small number had more than two

contracts. General LRP participants were much less likely than others to renew their contract at least once, perhaps in part because the General LRP requires a three-year contract as opposed to the two-year contract required by the AIDS and Clinical LRPs.

Participants in the four LRPs represent a range of background characteristics that vary by program, according to administrative data. Overall, 61 percent of all LRP participants were men, about two-thirds were white, 73 percent were age 30 to 39 when they started in the program, and more than 80 percent earned a medical degree. The General LRP has had the highest proportion of men, and the Clinical LRP has had the highest proportion of racial/ethnic minorities. The General LRP has had the lowest proportion of MDs while the ACGME and Clinical LRPs have had the highest. Collectively, the LRP has more underrepresented minorities (African American and Hispanic researchers) than our group of matched nonparticipants.

The retention survey collected additional data on participants' educational experiences. At the undergraduate level, a majority (53 percent) of participants earned a BS degree while 39 percent earned a BA, and 4 percent earned both degrees. The two most common areas of study were biology, biochemistry, or medicine (54 percent) and chemistry (21 percent). The most common subject of graduate study was medicine (63 percent); no other area accounted for more than 6 percent of LRP participants' area of concentration. For many participants, their academic pursuits resulted in substantial educational debt, presumably explaining their interest in loan repayment. At the point they entered the IRP, 30 percent carried educational debt in excess of \$100,000, and 56 percent carried educational debt between \$50,000 and \$100,000. Clinical LRP participants reported substantially higher debt levels than those in the AIDS and General LRPs, which is attributable to the fact that they were much more likely to have earned an MD. To help put debt loads in perspective, it is useful to consider salaries when participants took a research position at the NIH. Sixty-one percent reported a starting salary of less than \$50,000; 25 percent earned \$50,000 to \$65,000; and 14 percent received over \$65,000.

Can the LRP Attract Candidates to the IRP?

We found some evidence that the LRP helps attract candidates to the intramural program, but evidence also suggests that the incentive effect could be larger. The strongest evidence in support of a positive impact came from the recruiter survey. Directors of NIH fellowship programs for physicians were asked to report the fellowship acceptance rates for two subsets of candidates who received employment offers: those whom they presumed were eligible for the LRP and those whom they presumed were ineligible. The acceptance rate for those presumed eligible was 84 percent versus 67 percent for those presumed ineligible, considering the full data set (141 applicants across 27 programs). Given that some programs reported that all candidates had likely been eligible for the LRP while others reported no likely eligibles, we also examined results for just the subset of 6 programs (35 fellowship applicants) with both likely eligibles and likely ineligibles. The analysis yielded similar results, with the presumed eligibles demonstrating a job acceptance rate 19 percentage points higher than those presumed ineligible.

The evidence that incentives for recruitment might not have been fully realized comes from the CSBS. For the LRP to have a recruitment effect, scientists would, at a minimum, have to learn about the program's existence before deciding to accept an offer of a qualified intramural research position at the NIH. Therefore we asked IRP researchers when they first learned about the program. More than half (53 percent) of those who eventually received loan repayment did

not know about the LRP before starting work in the intramural research program. In addition, 86 percent of nonparticipants had not heard of the LRP when they took similar positions at the same time. Clearly, the program could not have influenced the decisions of the uninformed candidates to accept a position at the NIH. However, on the positive side, the potential problem of job applicants lacking timely knowledge about the LRP appears to have decreased over time. More recent cohorts were more likely than earlier cohorts to have been aware of the program's existence when they were considering intramural research positions. Information from our focus groups held in 2003 provides some support for this claim. Of the 19 LRP participants we spoke with, 15 learned about the program during the recruitment process before making a decision to come to the NIH.

An important dimension of the recruitment issue is how potential applicants find out about the LRP. The focus group participants learned about the program in different ways. While most learned about the LRP during their recruitment interviews, they did not necessarily hear about it from the NIH scientists mostly directly involved in their recruitment. Participants also learned about the LRP from their colleagues already at the NIH but not involved in recruitment and from professional meetings and journals.

A scientist's route to the NIH intramural research program depends on his or her education and research interests and affects the likelihood that he or she will be introduced to the LRP during recruitment. The NIH's training programs for physicians attract individuals with medical degrees who are interested in opportunities for training in basic science or clinical research. Postdoctoral training opportunities in the intramural research program attract both PhD and MD scientists interested in basic science research. According to NIH staff and focus group participants, recruitment through the training programs, particularly the ACGME-accredited training programs, is more structured. Therefore, candidates are more likely to learn about the LRP through these programs than through the recruitment process for postdoctoral training opportunities.

The fellowship program directors we surveyed for the study were generally familiar with one or more LRPs. At least 12 of the 30 responding program directors were each "very familiar" with the General-, ACGME-, and AIDS-Research LRPs. In addition, most of the directors reported that they used the program as a recruitment tool: 21 of 30 respondents either advertise the LRPs or mention them routinely as part of the recruitment process. But the results also suggest that the LRPs' potential usefulness is not maximized. First, some fellowship directors know little or nothing about one or more of the programs: 10 of 30 were "not at all familiar" with the ACGME LRP, 8 were similarly unfamiliar with the Clinical LRP, 7 were unfamiliar with the General LRP, and 5 were unfamiliar with the AIDS LRP. Second, seven directors reported that they do not mention the LRPs at all in the recruitment process. In some of these cases, however, the fellows may be less likely to be eligible for loan repayment, thus explaining why the directors do not mention the LRPs in the recruitment process.

Among the participants who responded to the retention survey, most of those who did know about the LRP when they took an intramural research position thought they would eventually receive loan repayment if they were to apply. How they developed such an impression remains unclear. They may have simply assumed that their chances were good based on either their debt-to-salary ratio or the track record for LRP receipt among others who had preceded them in their particular institute or center. It is also possible that an NIH official may have told them that their

chances were good. While this survey finding suggests that uncertainty about receiving loan repayment may not be a major impediment to the LRP as recruitment tool for many job applicants, such uncertainty was bothersome to several focus group participants. Moreover, the NIH staff we interviewed for the study also felt that the uncertainty reduces the LRP's potential role in the recruitment process.

Even if scientists know a great deal about the LRP before deciding to take a position at the NIH, the program may not be a major factor in that decision. The focus group participants described how several factors influenced their employment decisions, such as the opportunity to conduct clinical and basic science research, to work with patients, and to work at a prestigious institution with world-class facilities. For several focus group participants, the LRP also was a major reason to come to the NIH. One participant explained how loan repayment helped the NIH to be more financially competitive with the more lucrative opportunities offered elsewhere. For others, loan repayment was a minor or “tilting” factor that helped seal the decision to take a position at the NIH. For those who did not learn of the LRP until after accepting employment at the NIH, the LRP obviously was not a factor at all.

Can the LRP Retain Scientists in Biomedical Research?

Our quantitative analyses of retention outcomes showed higher rates of retention at the NIH at nearly every point in the researchers' career, with much of the difference accounted for by participants with medical degrees. Furthermore, retention in jobs related to specific or general research increased in the short run. While we predict based on extrapolations from past cohorts that participants will have longer careers at both the NIH and in various types of research than nonparticipants, the process analysis pointed to some reasons for questioning whether this prediction would hold for retention of current and future participants at the NIH.

The LRP could potentially affect three types of retention outcomes: retention at the NIH, retention in specific research (AIDS-related or clinical research), and retention in research in general. We examined all three outcomes using the retention survey data. Our primary analytic method was to compare the percentage of participants and nonparticipants remaining in an NIH or research position at each year since they began their research in the IRP. We made the comparisons with and without adjusting for individuals' background characteristics such as age, gender, race/ethnicity, country or region of origin, academic degrees, cohort, the IC in which they were first employed at the NIH, and initial job title. Here we summarize the regression-adjusted results:

- For retention at the NIH, LRP participants had higher rates of retention than nonparticipants over the entire 15-year sample period (Figure 1). After the first year, the differences in retention rates for participants and nonparticipants ranged from nine to 19 percentage points, and the difference was significant in nearly every year. Findings for subgroups based on graduate degree and cohort suggest that after the initial LRP contract period, physicians rather than PhD researchers accounted for the gap in retention rates between the two groups.

- LRP participants were more likely than nonparticipants to remain in AIDS research within the first five years, with a retention rate difference of 12 percentage points. After the sixth year, the retention rates for the two groups were similar, and fell gradually over time.
- Both participants and nonparticipants remained in clinical research positions at high rates, around 80 percent, for most of the period. The only significant difference in rates of retention occurred in years two and three, with participants having retention rates six to seven percentage points higher than nonparticipants.
- Participants were again six to eight percentage points more likely to have remained in any research job after two or three years than nonparticipants, though the rates for the two groups were similar in the subsequent years (Figure 2). A significant gap in the rates of retention for the two groups emerged again after ten years, though the findings on long-term retention are less reliable.

The pattern of retention rates over time shown in Figures 1 and 2 reflects the changes in the probability of leaving research over an individual researchers' career, but it also reflects changes in the size and composition of the group included in the analysis for each year. Furthermore, results for later years are based on individuals who began their NIH careers in the early 1990s, who may have faced different circumstances and opportunities than those who started in more recent years. Therefore, the pattern reflects changes in program effectiveness over time as well.

In addition to the year-by-year retention analysis, we estimated a duration model to assess possible retention effects and account for the censoring of observations, that is, for individuals who had not yet left research by the time of the survey. Using yearly retention data, we estimated a Cox proportional hazard regression model to determine the effect of various characteristics on the length of stay in each type of job. Using the coefficients from the model, along with the respondents' background characteristics, we predicted the average length of stay in research for participants and nonparticipants. For all four outcomes we examined, the predicted career duration for participants was significantly longer than for nonparticipants. For example, our model predicts that participants will stay in jobs at the NIH for 12 years, compared to 7 years for nonparticipants. Moreover, while predicted length of retention was shorter for both groups under alternate model specifications, the differences between participants and nonparticipants remained statistically significant.

The process analysis can provide some insight as to why or how the LRP might have a positive impact on retention. The focus groups gave the impression that the LRP may have a positive effect on participants' short-term retention at the NIH, specifically during the first two to five years after employment begins, which is consistent with the observed difference in retention rates. For instance, some focus group participants mentioned that the program provided important financial benefits other than salary, compensating for a salary lower than they might have received had they accepted a position elsewhere to work. Others said that the program provided intangible benefits—the award made them feel valued by the NIH and their supervisors. Some participants stayed beyond the term of their original contract by obtaining a one-year renewal LRP contract. The required two- or three-year work commitment means that some participants remain at the NIH longer than they might without a requirement. Some

participants, however, viewed the work commitment unfavorably, believing that it prevented them from pursuing the types of jobs for which they were training.

It seemed less likely, based on focus group comments, that the LRP will increase long-term retention at the NIH. Most focus group participants saw little or no chance of remaining at the NIH for more than a year or two beyond the end of their initial work contract, largely because fellowships are time-limited, and permanent FTE slots are reportedly difficult to secure in today's work environment at the NIH. On the other hand, we got the impression that the LRP may help to funnel some participants into research careers outside the NIH. Focus group participants and NIH staff generally acknowledged that, by substantially reducing the debt load of participants, the program would make it more feasible for them to take jobs involving research, for example, at universities, which might offer lower salaries than other career options open to them, such as private practice.

The combined evidence from the process and outcomes evaluation of the NIH Intramural LRP should be a basis for cautious optimism. The program, the population it targets, and the context within which it operates have undergone some changes and will continue to change in the future. However, the experiences to date provide the best available evidence on the program's functioning and effectiveness. This evidence from a careful analysis of primary data incorporating multiple perspectives supports the hypotheses that intramural loan repayment programs help the NIH attract and retain biomedical scientists. As policy makers contemplate decisions about program modification or expansion, or emulation of the NIH LRP in other contexts, additional and increasingly more rigorous evaluation will be needed.

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