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United States General Accounting Office

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Briefing Report to the Chairman, Subcommittee on Labor, Health and Human Services, Education, and Related Agencies, Committee on Appropriations, House of Representatives

May 1988

BIOMEDICAL RESEARCH

Issues Related to Increasing Size of NIH Grant Awards

135976

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United States
General Accounting Office
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Human Resources Division

B-224799

May 6, 1988

The Honorable William H. Natcher
Chairman, Subcommittee on Labor,
Health and Human Services,
Education, and Related Agencies
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

In the July 30, 1987, report accompanying the fiscal year 1988 appropriations bill for the Departments of Labor, Health and Human Services, and Education, and related agencies, we were requested to review the growth in biomedical research grants awarded by the National Institutes of Health (NIH). In subsequent meetings with your office we agreed to provide information on the following:

-- Trend data in the NIH budget for fiscal years 1983 to 1987, and the size of research project grant awards for those years.
-- Factors that may explain the increased size of awards.
-- Current procedures for insuring accountability; that is, the reviewing, monitoring, and reporting practices NIH employs in dealing with research grant recipients.

On March 22, 1988, we briefed your office on the results of our review and, as requested, we are providing this briefing report to summarize our work.

NIH conducts and supports biomedical research dealing with the causes, prevention, and cure of diseases. Through its intramural research program, NIH employees carry out research projects in the NIH laboratories. In its extramural research program, NIH awards grants, primarily to universities and medical schools, to conduct basic and clinical research.

Our review was done between October 1987 and April 1988, primarily at NIH in Bethesda, Maryland, where we examined official grant records and interviewed grants management and program management officials. We obtained documentation, including regulations and directives, from the Public Health Service (PHS), the Office of Inspector General in the Department of Health and Human Services (HHS), and the Office of Management and Budget (OMB) in Washington, D.C., and had discussions with officials from these agencies.

NIH BUDGET TRENDS AND GROWTH IN RESEARCH GRANTS

The NIH budget for biomedical research is divided into several funding mechanisms, including research project grants, intramural research, research centers, research and development contracts, and other activities. Overall funding of NIH increased by 54 percent from fiscal year 1983 to fiscal year 1987. In 1983, the authorized budget for NIH was $4.0 billion; by 1987 it had increased to $6.2 billion.

The majority of NIH grants are awarded as research project grants (RPGs) through its extramural research program to conduct basic and clinical research. Between 1983 and 1987, RPGs increased as a share of the NIH budget by 3.8 percentage points, from 52.2 to 56.0 percent. This increase was partly due to specific congressional direction to expand the funding of RPGs.

From fiscal year 1983 to fiscal year 1987, RPG funding rose by 65 percent, from $2.1 to $3.5 billion. At the same time, the number of RPGs awarded grew by 16 percent, from 16,829 to 19,480. Between fiscal years 1983 and 1987, the average RPG award rose 42.7 percent, from $123,800 in 1983 to $176,700 in 1987. The sharpest rise occurred between 1986 and 1987, when the average RPG award grew by 13.6 percent, from $155,500 to $176,700. (See pp. 12 to 22).

FACTORS THAT MAY EXPLAIN INCREASED SIZE OF GRANT AWARDS

Many factors have been cited as contributing to the increasing average size of research grant awards. These include:

-- inflation, and in particular, the fact that the costs of biomedical research may be rising more rapidly than the rate of inflation in general;
-- the types of grants funded,[1] including the large incremental increases in awards for competing renewals and the standard practice of allowing cost-of-living increases in noncompeting grant budgets without regard to actual inflation rates;

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[1]There are three types, or stages, of research project grants. A competing new grant is one based on an original request for support of a particular project or activity for a specific period; usually 3 to 5 years. A noncompeting continuation is one based on a request for continued support after the first year of a multiyear grant project. A competing renewal grant, also called competing continuation grant, is one based on a request for support after the first multiyear grant period has expired.

-- increased personnel costs, specifically for principal investigators and senior research staff;
-- indirect costs, which account for about one-third of the total grant amounts; and
-- other factors, including the increasing complexity of research and the increased use of human subjects and/or animals in research.

A significant amount of the 42.7 percent increase in the average grant award over this 4-year period merely offsets inflation, although the exact amount needed to offset inflation depends on which measure of inflation is used. NIH uses the Biomedical Research and Development Price Index (BRDPI), an index designed to measure changes in the costs of biomedical research, in order to express expenditures for its research and development activities in constant dollars; that is, dollars adjusted for inflation. When the BRDPI deflator is used, the average grant award measured in constant dollars rose 17.7 percent from fiscal year 1983 to fiscal year 1987.

A broader measure of inflation commonly used to analyze broad budget trends is the gross national product (GNP) implicit price deflator, an index that measures the overall price level for all goods and services produced in the entire economy. If the GNP deflator is used, the average constant dollar grant award rose 26.3 percent in the fiscal years 1983-87 period. While the BRDPI appears to be appropriate in comparing trends in research grants to the cost of conducting research, it is not as useful for comparing budget trends among different federal agencies. We believe that for the purpose of comparing changes in the NIH budget with those of other federal agency budgets, the GNP deflator provides a more useful index.

NIH and PHS have carried out studies dealing with other factors that may account for the increasing size of research grants. Results of their studies, however, have been inconclusive and are generally insufficient to explain the reasons for increases in the average size of research grants. (See pp. 24 to 47.)

ACCOUNTABILITY PROCEDURES

While NIH has ultimate oversight responsibility over grants awarded, it relies heavily on grantee institutions to carry out many oversight duties. NIH makes few site visits and receives limited financial data from grantees on required reporting forms.

NIH and HHS have relied increasingly on grantees to monitor and audit grants. HHS's Office of Inspector General (OIG) has audit responsibility for educational institutions that receive HHS grant funds. Most of the audit efforts have been shifted to the institutions, which are required to contract with independent certified public accounting firms for these audits and send copies of the audit reports to HHS's OIG for review. These audit reports are general in nature and do not focus on individual grants. Also, these reports are submitted to HHS regional offices and it appears that NIH program and grants management officials make little use of these reports in overseeing grant awards. (See pp. 48 and 50.)

RECOMMENDATIONS TO HHS

We recommend that HHS use both the GNP implicit price deflator and the BRDPI, as supplemental data to accompany NIH budget requests, to compare current and constant dollars of research grants.

The inconclusive information available to explain the increase (in constant dollars) for research grant awards over a 4-year period, along with the limited NIH and HHS monitoring and auditing activities, indicate that further study by HHS of the increasing size of research grant awards is warranted. We recommend that HHS analyze the increasing size of research grants, including the large incremental increases in competing renewal awards and the standard practice of allowing cost-of-living increases in noncompeting continuation budgets unrelated to the actual inflation rate. HHS should report to the Congress on the results of its analyses and any measures taken or required to assure the adequacy of controls over research grant awards.

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As requested by your office, we did not provide a copy of a draft of this report to the agency for comments. However, we discussed the information in this report with HHS, PHS, and NIH officials and incorporated their comments where appropriate. The officials with whom we met generally agreed with the contents of the draft report and concurred that our recommendations were appropriate.

Also, as agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time we will send copies to cognizant congressional committees and other interested parties and we will make copies available to others on request.

If we can be of further assistance, please call Ms. Janet L. Shikles, Associate Director, at 275-5451.

Sincerely yours,

Lawrence H. Thompson

Lawrence H. Thompson
Assistant Comptroller General

CONTENTS

ABBREVIATIONS

BRDPI	Biomedical Research and Development Price Index
GAO	General Accounting Office
GNP	gross national product
HHS	Department of Health and Human Services
NIH	National Institutes of Health
OIG	Office of Inspector General
OMB	Office Of Management and Budget
PHS	Public Health Service
RPGs	research project grants
TCR	Total Competing Requirements

BRIEFING REPORT

BIOMEDICAL RESEARCH:

ISSUES RELATED TO INCREASING SIZE OF NIH GRANT AWARDS

Objectives, Scope, and Methodology

- Summarize Trend Data on Size of Grants
- Provide Information on Factors That May Explain Increased Size of Awards
- Describe Accountability Procedures of Federal Research Funds

OBJECTIVES, SCOPE, AND METHODOLOGY

In the July 30, 1987, report (Report 100-256) accompanying the Department of Health and Human Services' fiscal year 1988 appropriations bill, the Chairman, Subcommittee on Labor, Health and Human Services, and Education, and Related Agencies, House Committee on Appropriations, requested us to examine the information available on increasing biomedical research grant awards.

In subsequent meetings with the Subcommittee staff we agreed to

-- provide trend data on the National Institutes of Health (NIH) budget for fiscal years 1983 to 1987, and the size of research project grants for those years;

-- review information on factors that may explain the increased size of awards; and

-- describe current procedures for ensuring accountability of federal research funds; that is, the reviewing, monitoring, and reporting practices NIH employs in dealing with research grant recipients.

Our review was performed between October 1987 and April 1988 at NIH in Bethesda, Maryland.

To develop an understanding of federal regulations and procedures relevant to research, we reviewed regulations from the Office of Management and Budget (OMB) and publications from the Department of Health and Human Services (HHS), Public Health Service (PHS), and NIH. We obtained budget and award data from and/or compiled by NIH's Division of Financial Management and the Office of Program Planning and Evaluation. The award data were compiled from grant award documents, rather than actual expenditure data.

We reviewed three HHS reports that examine issues related to the increasing size of research grant awards. The first, Report on the Rising Cost of NIH Research Project Grants, was prepared by the PHS Office of Management and issued in March 1986. The second, issued in early 1986 by NIH's Office of Program Planning and Evaluation, was Average Cost of a Research Grant. The third, also issued by this NIH office in July 1986, was Changes in Research Project Participation and Compensation Patterns in Competing R01 Awards to Institutions of Higher Education.[1]

We discussed accountability procedures for federal research grants and responsibilities relevant to auditing grant recipients with HHS's Office of Inspector General (OIG), PHS's Division of Contracts and Grants, and NIH's Division of Management Survey and Review and Financial Advisory Services Branch in the Division of Contracts and Grants.

To obtain information about the Biomedical Research Development and Price Index (BRDPI), we met with officials from NIH's Office of Program Planning and Evaluation and the Department of Commerce's Bureau of Economic Analysis, and reviewed supporting documents explaining the BRDPI. We interviewed officials in the offices of sponsored research programs at George Washington University, Johns Hopkins University, Georgetown University, and the University of Maryland at Baltimore to discuss the grants management process, accountability procedures, and possible reasons for increases in the size of research grants.

In addition, we discussed recent trends in the size of grant awards for biomedical research with representatives from several organizations and attempted to determine whether other studies had been completed on this issue. The federal agencies included the Bureau of Labor Statistics in the Department of Labor, National Science Foundation, Naval Research Laboratory in the Office of Naval Research, and the Veterans Administration. Other organizations we contacted to obtain information or reports concerning the growth of biomedical research included the American Association of Medical Colleges, American Association of University Professors, Association for Biomedical Research, Council on Government Relations, National Academy of Sciences, and Rand Corporation.

We did not verify the data or analyze the methodology NIH uses to collect data or develop trends. As requested by the chairman's office, we did not provide a copy of this draft to the agency for formal comments, but we discussed the report's contents with HHS, PHS, and NIH officials and incorporated their comments where appropriate. Our work was performed in accordance with generally accepted government auditing standards.

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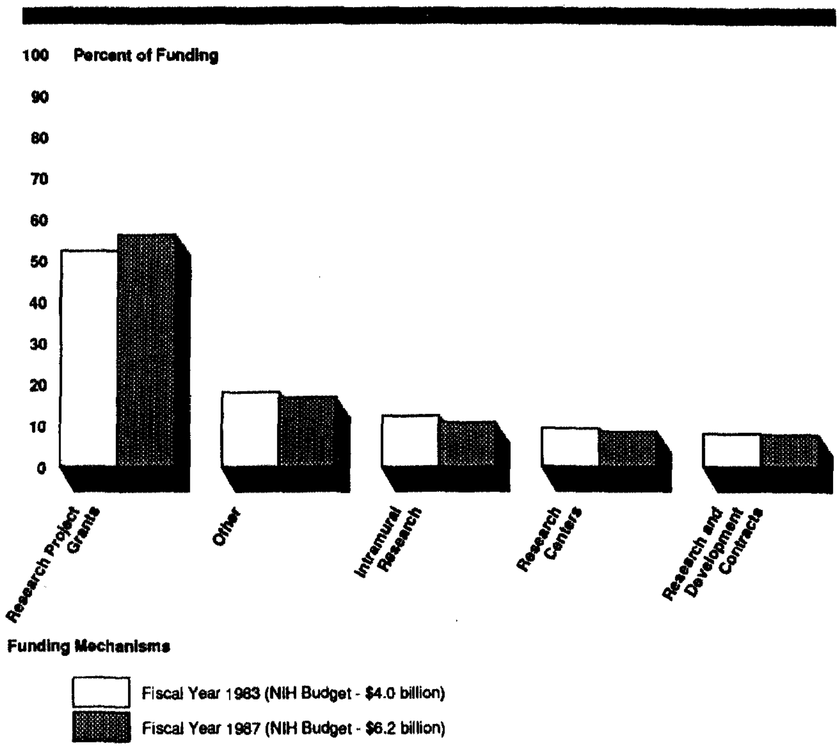
[1]An R01, the traditional or investigator-initiated research project grant, is awarded through a grantee institution for a specific effort or activity.

NIH Budget Trends

Figure 1: Percent Distribution of NIH Budget by Funding Mechanism (Fiscal Years 1983 and 1987)



Other Includes: Other Research, Research Training, Research Management and Support, Cancer Control, Construction, National Library of Medicine, Office of the Director, and Buildings and Facilities

NIH BUDGET TRENDS

The NIH budget for biomedical research is divided into several funding mechanisms, including research project grants, intramural research, research centers, research and development contracts, and other activities. Overall funding of NIH increased by 54 percent from fiscal year 1983 to fiscal year 1987. In 1983, the budget for NIH was $4.0 billion; by 1987 it had increased to $6.2 billion.

The majority of NIH grants are awarded through its extramural research programs as research project grants (RPGs) to institutions, primarily universities and medical schools, to conduct basic and clinical research. Most RPGs are for investigator-initiated projects dealing with a specific effort or activity. Between 1983 and 1987, RPGs increased as a share of the NIH budget by 3.8 percentage points, from 52.2 to 56.0 percent (see fig. 1). During this time, RPGs were the only funding mechanism that had a growing share of the NIH budget. The increase was partly due to specific congressional direction to expand the funding of RPGs.

The next largest mechanism is intramural research. Ten of the funding units, usually called institutes, maintain intramural research programs by conducting biomedical research in their own laboratories and clinics. NIH currently has about 2,700 research projects in progress and is one of the largest research centers in the world. These projects are conducted by federal employees working in federal programs. The intramural research share of the NIH budget declined from 12.4 percent in 1983 to 10.8 percent in 1987.

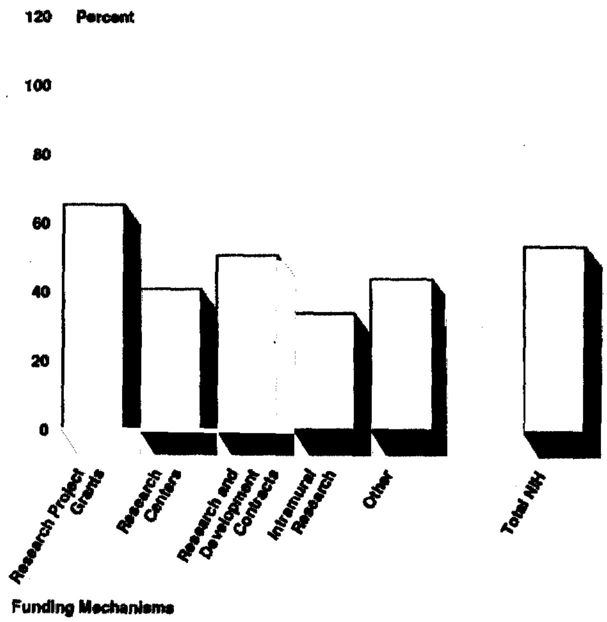
Research center grants are awarded to institutions on behalf of a program director and a group of collaborating investigators and provide support for long-term, multidisciplinary programs with particular major objectives. The research centers' share of the NIH budget declined from 9.3 to 8.5 percent between 1983 and 1987.

Research and development contracts are awarded to nonprofit and commercial organizations for scientific research. These projects, directed toward particular areas or problems, encourage use of current advances in knowledge and technology. Contracts, as a share of the NIH budget, declined from 8.0 to 7.8 percent between 1983 and 1987.

The other components of the NIH budget include other research, research training, research management and support, cancer control, construction, National Library of Medicine, Office of the Director, and buildings and facilities. Between 1983 and 1987 their share declined from 18.1 to 16.9 percent.

NIH Budget Trends (Continued)

Figure 2: Percent Growth By Funding Mechanism (Fiscal Years 1983-87)



Other Includes: Other Research, Research Training, Research Management and Support, Cancer Control, Construction, National Library of Medicine, Office of the Director, and Buildings and Facilities.

While RPGs represented the only mechanism with an increasing share of NIH's budget, all mechanisms grew in absolute terms (see fig. 2). Between 1983 and 1987, the total NIH budget grew by 54 percent, with RPGs growing at the most rapid rate--65 percent. Research centers grew by 40.5 percent, contracts by 50.5 percent, intramural research by 33.5 percent, and the combination of other expenditures (including other research, research training, research management and support, cancer control, construction, National Library of Medicine, Office of the Director, and buildings and facilities) by 43.8 percent.

Growth in Research Grants

Trends in Number of RPG Awards and RPG Funding (Percent Change from Fiscal Years 1983-87)

Growth in

- NIH Budget: 54%
- RPG Funding: 65%
- RPGs: 16%
- Average RPG Award: 42.7%

GROWTH IN RESEARCH GRANTS

While NIH's budget increased 54 percent from fiscal year 1983 to fiscal year 1987, RPG funding rose by 65 percent from $2.1 to $3.5 billion. At the same time, the number of RPGs grew by 16 percent from 16,829 to 19,480.

RPGs include 10 subcategories; the predominant one being the traditional investigator-initiated grant. There are also three different types or stages of RPGs, including competing new, competing renewals, and noncompeting continuations.

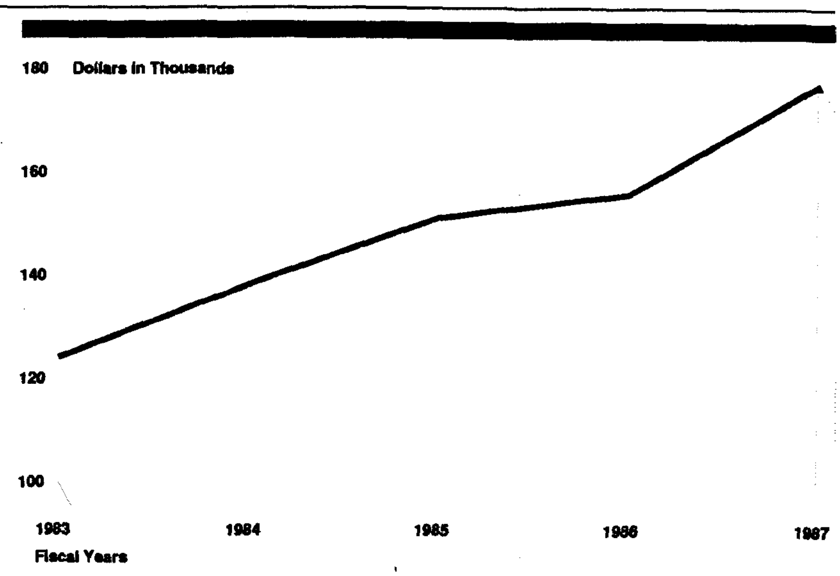
1. A competing new grant is one based on an original request for support of a particular project or activity. The initial grant award provides funds for the first 12 months and recommends support for the remainder of the grant period. Usually the total grant period ranges from 3 to 5 years. In 1987, NIH funded 3,401 new RPG grants.

2. A competing renewal grant is one based on a request for support (usually 3 to 5 years) after the original grant period has ended. In 1987, NIH funded 2,949 RPG renewals.

3. A noncompeting continuation grant is for continued support of a previously approved multiyear grant project. According to NIH, funds for these multiyear projects are considered to be "committed" when the project is initially approved. However, grantees must apply for funds each grant year through a noncompeting continuation grant. In 1987, NIH funded 13,130 RPG continuation grants.

Growth in Research Grants (Continued)

Figure 3: Average RPG Awards in Current Dollars (Fiscal Years 1983-87)



Between fiscal years 1983 and 1987, the average RPG award rose 42.7 percent from $123,800 in 1983 to $176,700 in 1987. The sharpest rise occurred between fiscal years 1986 and 1987, when the average award grew by 13.6 percent, from $155,500 to $176,700.

NIH Budget Estimation Process Is Unique

- NIH Uses Total Competing Requirements (TCR) Model
- Process Assumes All Approved Applications Are Funded
- March 1986 PHS Study Recommended NIH Use Projected Actual Costs Process in Tandem With TCR Model in Preparing Budget

NIH BUDGET ESTIMATION PROCESS IS UNIQUE

NIH uses a unique procedure for estimating its budget, which, according to PHS, generally overestimates grant costs and results in a budget level higher than that required for the projected number of awards. In the late 1970's, at the request of the Congress, NIH staff initiated a multistage process to calculate future year estimates of the awards of approved grant applications. The process, called the Total Competing Requirements (TCR) model, is designed to identify the amount needed by NIH to fund all approved competing applications, assuming there are no budget constraints. That is, the TCR model is based on the premise that all applications recommended by initial review groups for approval would be funded.

Beginning with the fiscal year 1982 budget, NIH has used the TCR model to develop estimates of the costs of competing new and competing renewal research grants in the budget request. The first part of the activity includes developing estimates of the number of competing new and renewal applications to be reviewed, and estimates of the number and dollar amounts of competing applications to be recommended for approval. The second activity includes making technical and program adjustments to assure new or expanded areas of research, such as Acquired Immune Deficiency Syndrome and Alzheimer's Disease, are reflected in these estimates. According to an NIH official, the TCR model introduced consistency across institutes for budget development procedures. The TCR model, according to PHS, does not take into consideration the number of applications and dollar amounts actually awarded.

In its March 1986 study, PHS reported on the increase in the average size of research grants and questioned the NIH budget formulation process, specifically citing the TCR model. The report did not specify the link between the TCR process and the increased cost of research. However, PHS reported that the TCR process generally overestimated grant costs and did not adapt quickly to changes in economic conditions, such as decreases in the rate of inflation. NIH officials emphasized that while in some years the costs estimates were overstated, in others they were understated.

The Projected Actual Cost Process--used by PHS components other than NIH--uses the latest actual award data and inflation and growth factors to arrive at estimated average costs of the three types of grants. PHS believes this process is more reliable than the TCR process because it uses actual award data from the most recent fiscal year. In its report, PHS stated that most other PHS agencies use actual award data to make budget projections. PHS recommended that NIH use the Projected Actual Cost Process in tandem with the TCR process and evaluate how each process estimates research project grant amounts.

As of April 1988, NIH had not implemented this recommendation. NIH officials told us they do not believe there is a link between the TCR process and the increased amounts of research grants. They also stated they have not been able to reach agreement with PHS on the growth factor to use in estimating the amounts for competing grants.

Factors That May Explain Average Award Increases

(1) Adjusting for Inflation

(2) Types of Grants Funded

(3) Increased Personnel Costs

(4) Indirect Cost Rates

(5) Other Factors

FACTORS THAT MAY EXPLAIN AVERAGE AWARD INCREASES

PHS and NIH officials have identified several possible factors to explain why the average NIH research grant award has been increasing. PHS issued a report in March 1986, that used NIH computer-based data to analyze RPG awards for fiscal years 1980 through 1985. NIH looked at selected issues in its study of personnel compensation and staffing patterns of grants and issued a report in July 1986. Many factors were cited by PHS and NIH as potentially explaining the increase in the average grant awards. While there has not been a full analysis addressing the actual influence of these factors and their effects on the NIH budget, we discuss them below.

(1) Adjusting for Inflation
NIH uses the BRDPI, an index designed to measure changes in the costs of biomedical research in order to express expenditures for its research in constant dollars (i.e., adjusted for inflation). The BRDPI appears to be appropriate in comparing trends in NIH research grants to the costs of conducting research. However, the index is not appropriate when comparing the growth of the NIH budget with the budgets of other federal agencies.

(2) Types of Grants Funded
Shifts in the mix of the different types of grants (e.g., competing new grants, noncompeting continuations, or competing renewals), along with variations in their award amounts may account for part of the increase in the average size of grants. One issue is NIH's practice of allowing annual cost-of-living increases unrelated to the rate of inflation for noncompeting continuation grants.

(3) Increased Personnel Costs
Personnel is the largest component of the grant budget accounting for between 63 and 72 percent of direct costs, and might be the single most significant factor in award increases.

(4) Indirect Cost Rates
Indirect costs, which account for about one-third of total grant amounts, have also been cited as a possible reason for the increased size of research grants.

(5) Other Factors
Other potential reasons for increases in the average size of grants include: the increasing complexity of research, increased use of human subjects, and new guidelines for the care and housing of animals.

(1) Adjusting for Inflation

- Biomedical Research and Development Price Index (BRDPI)

- GNP Deflator Preferable for Reflecting Economy-Wide Price Level

(1) Adjusting for Inflation

One important factor accounting for increases in the size of grants is inflation. NIH uses BRDPI, an index designed to measure changes in the costs of biomedical research in order to express expenditures for its research and development activities in constant dollars; that is, dollars adjusted for inflation. NIH had the index developed in the mid-1970's because of its concern that the price trends in biomedical research and development differed from general price trends. From the late 1970's until 1986, when the latest revision occurred, the index was maintained and periodically evaluated and revised by the Government Division of the Bureau of Economic Analysis in the Department of Commerce. The latest revision was based on fiscal year 1984 NIH funding patterns.

The BRDPI measures the costs of goods and services used to conduct biomedical research; for example, the salaries of biomedical researchers, the rental rates of laboratory facilities, and the cost of supplies. Based on our review, the BRDPI appears to be appropriate in comparing trends in NIH research grants to the costs of conducting research. The goods and services that comprise the market basket of the index appear to include those purchased by NIH, the largest supporter of biomedical research in the country. As is appropriate in constructing such an index, the costs used to construct this index are highly disaggregated; that is, separated into component parts. For example, in measuring the change in academic personnel costs, data on the average salary of university professors for each university that received funds from NIH were used rather than the national average salary of all university professors.

Like most price indices, the BRDPI does not adjust for changes in the quality of the goods and services which comprise the market basket. For example, the BRDPI does not correct for changes in the quality or level of personnel involved in research. Thus, if over time the number of researchers with doctoral degrees increased relative to the number of researchers with masters degrees, the BRDPI would erroneously attribute to inflation cost increases that are actually due to increases in the quality of personnel, because it does not adjust the researchers' salaries to account for increases in the quality of personnel. Therefore, if during the 1980's the goods and services used in producing biomedical research have improved in quality, the BRDPI would overstate the cost increases that have occurred.

The movement of the BRDPI does not depend unduly on actions taken by NIH. This can be seen by examining the two key components of the BRDPI--academic personnel costs and indirect costs. These two components were responsible for about 57 percent of the movement of the BRDPI from 1983 to 1986, while academic, nonpersonnel costs and nonacademic grants and contracts accounted for the other 43 percent. The prices of these two key components are determined largely outside of NIH's influence.

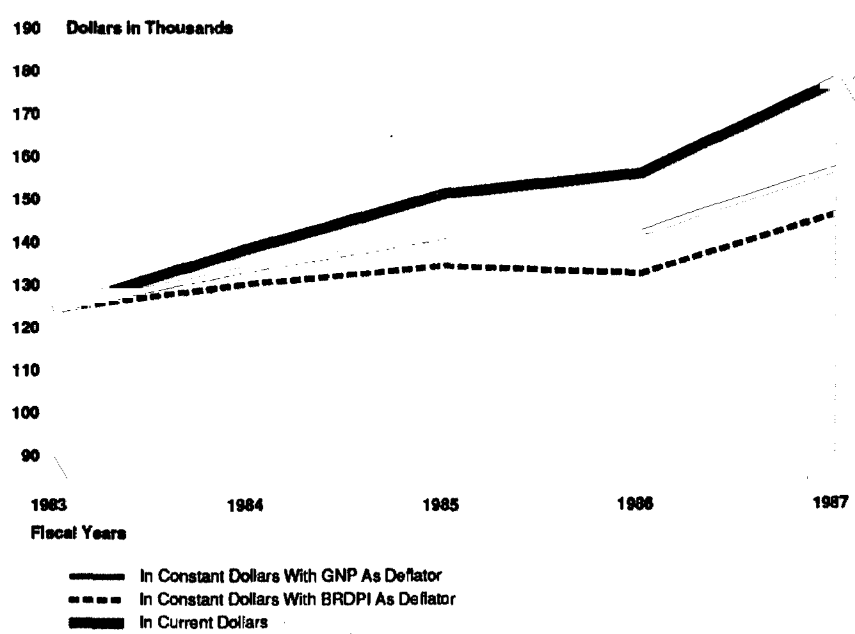
The salaries used to calculate the index are representative of all academic salaries, not only those of biomedical researchers. Indirect costs are arrived at by multiplying the direct cost of a grant by the grantee's negotiated indirect cost rate. The allowable items universities may include in direct costs were prescribed in OMB Circular A-21. Each university receiving grants has its own indirect cost rate. This rate is negotiated with either the Department of Defense or HHS. This rate pertains to all federally funded grants the university receives, not only NIH grants. Consequently, the price changes of major components that determine the levels and rates of change of the index are not determined solely within the biomedical research and development industry.

The BRDPI appears to be an appropriate deflator for analyzing the budget options of NIH. It is reasonable to deflate by the BRDPI when comparing changes in the levels of NIH funding for biomedical research among universities receiving grants. The BRDPI also appears to be an appropriate deflator when comparing changes in the levels of biomedical research for particular NIH institutes.

For purposes of comparing the changes of NIH's budget with those of other federal agency budgets or the entire federal government, the BRDPI is not as useful because federal budgets encompass a much broader range of goods and services than those considered in developing the BRDPI. A more appropriate index would be the GNP implicit price deflator. The GNP implicit price deflator is an index that measures the overall price level for all goods and services produced in the entire economy. Therefore, if the change in the amount of real budgetary resources spent on biomedical research relative to other budgetary items is an issue, the GNP deflator should be used to obtain constant dollar estimates. This is consistent with budgetary guidance of the OMB, which calls for use of the GNP deflator.

Adjusting For Inflation (Continued)

Figure 4: Average RPG Awards In Current and Constant Dollars (Fiscal Years 1983-87)



Note: Base Year 1983 = 100

This figure shows the average RPG award in current dollars and constant dollars, using both the BRDPI and the GNP deflator. Between fiscal years 1983 and 1987, average awards in current dollars increased by 42.7 percent. If the BRDPI is used as the deflator, average awards increased 17.7 percent, and if the GNP deflator is used, average awards increased 26.3 percent.

(2) Types of Grants Funded

Table 1:
Comparison of Average RPG Awards
by Type of Grant[a]
(Fiscal Years 1983-87)

Grant Type	Percent of grant awards 1983	Percent of grant awards 1987	Average awards 1983	Average awards 1987	Percent change in current dollars	Percent change in constant dollars (BRDPI deflator)[b]	Percent change in constant dollars (GNP deflator)[b]
	(fiscal years)						
Competing New	18.4	17.5	$100,836	$155,599	54.3	27.3	36.4
Competing Renewals	13.0	15.1	$147,185	$198,417	34.8	11.2	19.2
Noncompeting Contin-uations	68.5	67.4	$124,467	$175,400	40.9	16.2	24.6
Totals	100.0[c]	100.0	$123,800	$176,700	42.7	17.7	26.3

[a]Disaggregated data exclude supplemental grant awards. Total average awards include supplemental grant awards, which are about 1 percent of total awards.

[b]The percent changes were calculated using fiscal year 1983 as the base year.

[c]Total does not add to 100 due to rounding.

(2) Types of Grants Funded

According to NIH officials, the shift in the mix of various types and activities of research grants along with variations in their award amounts are also potential reasons for average grant increases. Between fiscal years 1983 and 1987, based on NIH data, competing new and noncompeting continuation grants' share of all grant awards decreased by 0.9 and 1.1 percent, respectively. Competing renewals' share increased by 2.1 percent. NIH officials stated that they believed the relative increase in the share of competing renewal grants is significant and contributed to the increase in the average awards of grants. Based on our calculations, however, the shift in the mix of grant types accounted for less than 1 percent of the total increase in average grant amounts.

While competing renewals were the only type of grant that increased their share between 1983 and 1987, and are the most expensive type on average ($198,417 in 1987), the average size of this type of grant grew in real terms at the slowest rate; that is, at 19.2 compared to 24.6 percent for noncompeting continuations and 36.4 percent for competing new grants. Clearly each type of grant contributed to the increase. However, the type of grant that most influenced the average size of awards were the noncompeting continuations, accounting for 68.5 percent of all grants in 1983, and 67.4 percent in 1987. According to NIH officials, comparison of aggregate information like this, however, may be misleading because of variation in specific grants included in the three types each year.

While little data have been systematically developed on the reasons for these award increases, some specific issues have been raised regarding noncompeting continuations. For these grants NIH grant management officers annually review requests for grant funds during the noncompeting years and justifications for increases over the prior year's funding. According to NIH officials, in noncompeting continuation years, a principal investigator generally includes in the grant budget anticipated cost increases, such as: potential promotions, cost-of-living allowances, and increased costs of supplies and contracts.

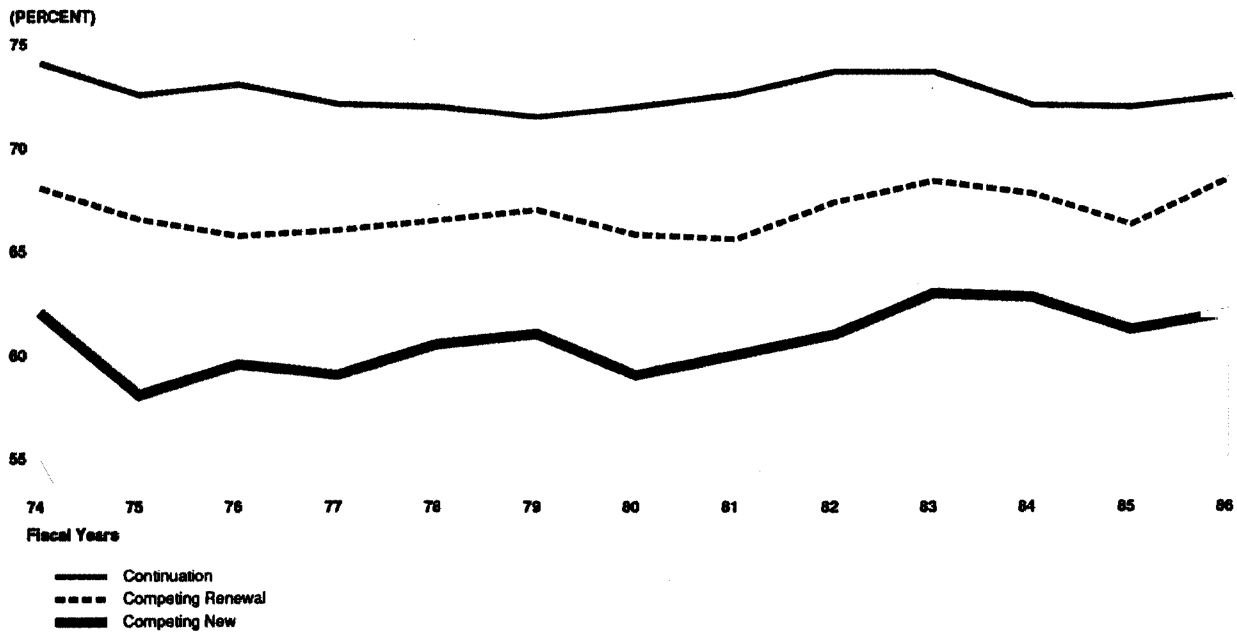
The 1986 PHS study reported that, for noncompeting continuations, various institutes allowed annual increases of 6 percent for personnel and from 6 to 15 percent for other items, such as supplies and travel. Subsequently, NIH officials reported that, beginning in fiscal year 1987, NIH established a 4-percent limit on annual increases for all grant budget items. As in prior years, this limit is not based on the actual rate of inflation, according to NIH officials, although most of the increases are intended to offset the effects of inflation. We were told by NIH officials, that the limit is applied on a case-by-case basis and exceptions may be made.

The PHS study and NIH officials have provided some observations on competing renewals. Competing renewals accounted for 17.0 percent of total RPG funding in 1987. Between fiscal years 1983 and 1987, the average award of competing renewals increased by 34.8 percent. Both NIH and PHS have observed that when the original multiyear period of an RPG expired and the grantee submitted a competing renewal application, the average award for direct costs of the RPG increased by about 30 percent over the last noncompeting continuation year for which funds were provided. PHS and NIH officials said data that they compiled showed personnel and equipment accounted for most of the average increase in the award.

Finally, we found little direct analysis of why the average awards of competing new grants are increasing at 54.3 percent in current dollars, compared to competing renewals, which increased 34.8 percent in current dollars. Competing new grants increased 27.3 percent in BRDPI deflated constant dollars, and 36.4 percent in GNP deflated constant dollars.

(3) Increased Personnel Costs

Figure 5: Personnel Costs as Percent of Direct Costs for Investigator-Initiated Awards, by Type (Fiscal Years 1974-86)



These awards represent about 75 percent of approved RPGs annually.

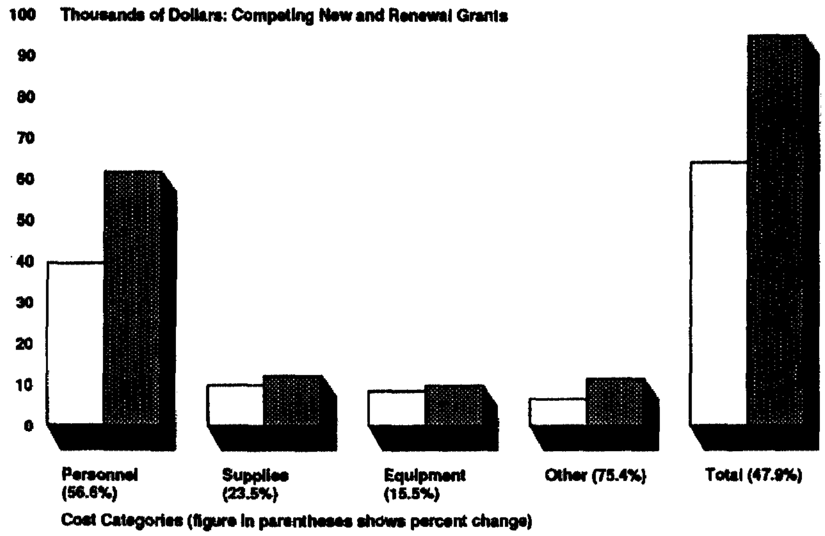
(3) Increased Personnel Costs

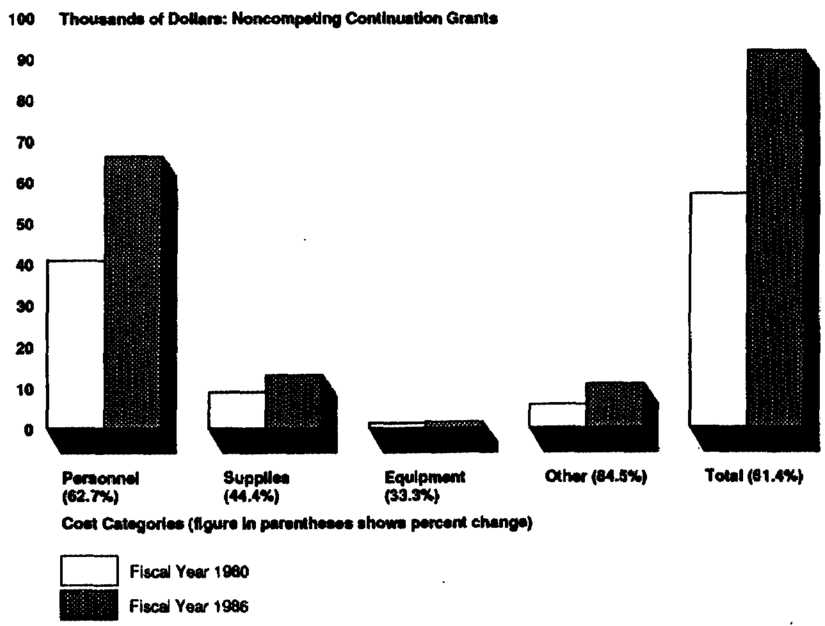
Personnel costs account for most of the total direct costs of NIH research grants. As shown in figure 5, however, personnel costs as a percent of direct costs for investigator-initiated awards have changed relatively little over time.

The traditional investigator-initiated grant is the predominant category of RPGs funded annually by NIH. Personnel costs as a percent of direct costs are the lowest for competing new grants. According to NIH officials, during the first year of a grant, researchers are gearing up for their projects, setting up their laboratories, and buying supplies and equipment; therefore, less research staff are needed. Personnel costs for competing renewals and noncompeting continuation grants are higher than for competing new grants possibly because the research efforts have expanded beyond the initial stages, the laboratory has been equipped, and personnel costs become a more significant factor.

Increased Personnel Costs (Continued)

Figure 6: Growth in Average Direct Cost for Investigator-Initiated Grants (Fiscal Years 1980-86)





Other includes travel, patient care, contractural/third-party costs, alterations and renovations, and consulting services.

The growth in average direct costs for investigator-initiated grants is shown in NIH's trend data for fiscal years 1980 through 1986. These data are based on grant award notices, not actual expenditure data. As the figure shows, personnel is the largest direct cost category, accounting for about 63 percent of total direct costs for competing grants (both new and renewals) and about 72 percent of total direct costs for noncompeting continuation grants.

For competing grants, average personnel costs grew 56.6 percent between 1980 and 1986, compared to an overall average direct cost growth of 47.9 percent. For noncompeting grants, personnel costs grew 62.7 percent compared to the 61.4 percent increase in the average direct cost of those grants.

Increased Personnel Costs (Continued)

Possible Explanations
- Higher Wages
- More Personnel on Grant Projects
- Use of Higher Level Personnel
- Less Voluntary Efforts

March 1986 PHS Study Recommended that NIH Review Rising Personnel Costs

Four possible explanations have been given for increased personnel costs: higher wages paid researchers, more personnel working on grants, use of higher level personnel, and less voluntary efforts. Little information is available to support these explanations or quantify how much they might account for increases in the average size of grants. The best data available came from a study that resulted in the NIH report Changes in Research Project Participation and Compensation Patterns in Competing R01 Awards to Institutions of Higher Education, issued in July 1986.

In its study of competing investigator-initiated grants, NIH's Office of Program Planning and Evaluation compared staffing and personnel compensation of NIH awards for fiscal years 1981 and 1985 using data collected from six NIH institutes' grant files. While the report stated that the information developed may not be statistically representative of all of NIH, it noted that the six institutes provided a good cross section of NIH. Therefore, NIH officials believed that any trends obtained from the sampled data were likely to be found in the NIH universe. The following are NIH's observations from the study:

-- Average compensation of principal investigators by NIH increased by 33.9 percent in 4 years from a 1981 figure of $13,788 to $18,467 in 1985. For other nondoctorate-level staff, average compensation increased 12.4 percent.

-- More principal investigators are charging their compensation, (salary plus fringe benefits) against research project grants (77.6 percent of principal investigators in 1981 charged compensation to projects compared with 81.0 percent in 1985).

-- More doctorate-level staff are charging compensation to research project grants (57.6 percent in 1981, compared with 98.5 percent in 1985).

-- Nondoctorate-level staff are less frequently listed as providing free service to research projects (6.4 percent in 1981; 0.2 percent in 1985).

While these data show that more senior and costly personnel are charging compensation to research grants, NIH has not determined the extent to which this has contributed to increases in average grant awards. NIH officials told us that grantee institutions' requests for increased salary support may be due to an OMB Circular A-21 revision, which indicated that indirect costs cannot be collected on donated research efforts. According to the officials, even though the revision was issued in 1979, since it was phased in over the next few years, the impact of this change did not fully materialize until the mid-1980's.

The rising average amount of competing renewals, the most expensive type of grant, may be largely accounted for by increased personnel and equipment costs. NIH officials reported that principal investigators view submission of a competing renewal as an opportunity to hire more staff and/or purchase more equipment to bring the project to completion. NIH found that for competing investigator-initiated awards made in fiscal years 1983 through 1985, on average, personnel accounted for about 47 percent of the increase over the last noncompeting year and equipment accounted for about 33 percent.

(4) Indirect Cost Rates

Table 2:
RPG Indirect Costs as a Percent
of Totals Awarded
for Fiscal Years 1983-87
(dollars in thousands)

Fiscal year	Total grant awards	Indirect costs awarded	Average indirect cost rates
1983	$2,078,746	$ 655,053	31.5
1984	2,368,505	752,584	31.8
1985	2,721,561	875,243	32.2
1986	2,902,362	918,634	31.7
1987	3,433,295	1,074,839	31.3

(4) Indirect Cost Rates

Indirect costs are those costs that are not specifically attributed to individual projects, such as administrative expenses, facility operations, maintenance expenses, and depreciation allowances. The principles for determining and assigning allowable indirect costs for research grants to educational institutions are explained in OMB Circular A-21. The principles are designed to assure that the federal government bears no more than its fair share of the total costs of research projects.

HHS has responsibility for negotiating and auditing indirect cost rates for about 98 percent of educational institutions receiving HHS grants. Before fiscal year 1966, the federal government used a fixed national rate to establish the amount of federal payments for indirect costs allocated to federally sponsored research. The federal government in that year adopted the current policy of negotiating individual indirect cost rates with each university.

Federal payments for indirect costs increased gradually from an average of 22 percent of total federal research support in fiscal year 1970, to an average of 31 percent in 1982. As shown in the table, average indirect cost rates have remained relatively stable since 1983.

(5) Other Factors

- Complexity of Research
- Shift from Basic to Clinical Research
- Equipment Costs
- Use of Human Subjects
- Use of Animals

(5) Other Factors

In our discussions with officials from HHS, OIG, PHS, NIH, and grantee universities, as well as representatives of organizations involved with research, several other factors concerning the increasing size of awards were raised. Although data have not been compiled to support the statements, several sources cited the following:

Complexity of research--Biotechnology is a complex field that requires advanced research techniques, highly trained staff, elaborate equipment, and adequate time. However, the extent to which NIH-sponsored research has in recent years become more complex in these respects and increased the average NIH grant award cannot be determined from the computerized data compiled by NIH.

Shift from basic to clinical research--Some have said that the emphasis of research has shifted from basic to clinical; that is, from laboratory research to patient care. NIH data do not show whether this has occurred. NIH officials were not aware of any studies substantiating this possible shift.

Equipment costs--Some have suggested that equipment is more expensive and, therefore, contributes to the increasing costs of research grants. While data have not been compiled on price trends for biomedical research equipment, according to NIH grant award data, equipment as a percent of direct costs decreased from 1980 to 1986.

Use of human subjects--Studies involving human subjects may be more expensive due to factors such as liability insurance costs and documentation collected to ensure the safety of human subjects. However, according to NIH data, the proportion of grant awards that used human subjects has declined, comprising 27.9 percent in 1981, and 26.4 percent in 1985.

Use of animals--New animal care guidelines concerning the treatment of and space facilities for animals may increase the cost of research. In addition, expenses to procure animals may have increased. NIH data are not compiled to show the extent to which an increase in the cost of animals or their care contributed to the increase in the average grant award.

Accountability Procedures

- Three Level Review System
- Financial Data Reported to NIH Are Limited
- NIH Relies on Grantees to Monitor Grants
- HHS Audits Seldom Performed

ACCOUNTABILITY PROCEDURES

NIH uses a three level review system to assess all research grant applications. This review system includes a scientific peer review of project applications by initial review groups, also called study sections, and a second review by statutorily mandated institute advisory councils or boards. Another review, which includes a financial review and a programmatic review, is conducted by the NIH institutes' grants management staffs and program officers.

After grants are awarded, principal investigators are required to submit annually to NIH a progress report on their research and a financial status report documenting yearly and cumulative expenditures for direct and indirect costs. Before 1976, grantees reported line item expenditures (for example, personnel or equipment) for each grant. OMB Circular A-110, issued in 1976, defined the current standard for reporting grant expenditures on the financial status report form. Since this form does not show line item expenditures of funds, NIH staff cannot compare budgeted amounts for the various categories with the actual amounts spent. However, according to Circular A-110, grantees are required to maintain accounting records that are supported by source documents.

According to NIH officials, like many other federal agencies, NIH and HHS have also relied increasingly on the controls and policies established by grantees to monitor research grants. PHS requires grantees to employ sound management practices to ensure that program objectives are met and project funds are spent in the approved manner. Due to the large number of grants funded, NIH makes few site visits, but recipients are to monitor performance under grants to ensure that work is being accomplished within the time schedules and that other performance goals are being met.

HHS's OIG has audit responsibility for educational institutions that receive HHS grant funds. Most of the audit efforts have been shifted to the institutions, which are required to contract with independent certified public accounting firms for these audits and send copies of the audit reports to the responsible OIG regional office for review.

During fiscal year 1982, the OIG devoted about 180 staff years to auditing grantee educational institutions and/or reviewing audit reports prepared by others. By fiscal year 1986, these efforts involving grantee educational institutions decreased to 20 staff years. According to OIG officials, in fiscal year 1988, about 35 staff years will be devoted to these efforts.

While HHS's OIG relies on the audit reports of accounting firms to assure that adequate financial controls exist, these audit reports are general in nature and do not focus on individual grants. Also, these reports are submitted to HHS regional offices and it appears that program and grants management officials make little use of them in overseeing grant awards.

Recommendations

- HHS Use GNP Implicit Price Deflator and BRDPI to Supplement NIH Budget Requests

- HHS Conduct Study of Factors Contributing to High Grant Awards and Report Results and Actions to the Congress

RECOMMENDATIONS

Between fiscal years 1983 and 1987, RPG funding increased 65 percent while the number of RPGs awarded increased only 16 percent. The average grant award rose 42.7 percent, from $123,800 in 1983 to $176,700 in 1987.

Many factors have been cited as explaining or contributing to the increasing average size of research grants. These include: inflation, and in particular, the fact that the costs of biomedical research may be rising more rapidly than prices in general; the types of grants funded, including the large incremental increases in awards for competing renewals and cost-of-living increases in noncompeting grant budgets without regard to actual inflation rates; increased personnel costs, specifically for principal investigators and senior research staff; indirect costs, which account for about one-third of the total grant amounts; the increasing complexity of research; and the increased use of human subjects and/or animals in research projects.

During this 4-year period inflation accounted for a significant amount of the 42.7 percent increase in the average size of awards, although how much of the increase is explained by inflation depends on the deflator used. If the BRDPI deflator is used, average awards in real terms went up 17.7 percent. If the GNP deflator is used, however, average awards went up 26.3 percent. While the BRDPI seems to provide an appropriate mechanism for understanding the causes of the increase within NIH, we believe it is also important to understand how NIH cost trends compare with those of other federal agencies. For this purpose, the GNP deflator provides a better measure of inflation because it is more universally applicable.

While NIH and PHS have carried out studies dealing with the increasing research grant awards, the results of their studies have been inconclusive in that data on the magnitude and reasons for the increases were not developed. In general, the studies do not sufficiently explain the reasons for increases above those necessary to adjust for inflation in average research grant awards.

NIH has ultimate oversight responsibility over grants awarded; however, it relies heavily on grantee institutions to carry out many oversight duties, including having audits conducted. Also, NIH makes few site visits and receives limited financial data from grantees.

The inconclusive information available to explain increases (in constant dollars) for research grant awards over a 4-year period, along with the limited NIH and HHS monitoring and auditing activities, indicate that further study by HHS of the increasing size of research grant awards is warranted.

We recommend that HHS use both the GNP implicit price deflator and the BRDPI, as supplemental data to accompany NIH budget requests, to compare current and constant dollars of research grants. We also recommend that HHS analyze the increasing size of research grants, including the large incremental increases in competing renewal awards and cost-of-living increases in noncompeting continuation budgets unrelated to the actual inflation rate.

HHS should report to the Congress on the results of its analyses and any measures taken or required to assure the adequacy of controls over research grant awards.

The HHS, PHS, and NIH officials with whom we met to discuss the information included in this report generally agreed with the facts presented and concurred that our recommendations were appropriate.

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