JCI The Journal of Clinical Investigation

The economy of science

Andrew R. Marks

J Clin Invest. 2004;114(7):871-871. https://doi.org/10.1172/JCI23182.

Editorial

We are in the midst of an era of plummeting pay lines at the NIH. History shows that when the federal deficit is high, NIH pay lines tend to fall, and the impact on biomedical research can be disastrous. Equally bad is the disincentive for the future generations of biomedical researchers who observe their mentors struggling to get adequate funding. How many bright young people will be turned away from careers in biomedical research? How much innovative science will be delayed or never initiated, how many new cures never realized? At a time of unprecedented challenges and remarkable technological advances that enable us to address those challenges, lack of funding is a threat to our society.

The economy of science

We are in the midst of an era of plummeting pay lines at the NIH. History shows that when the federal deficit is high, NIH pay lines tend to fall, and the impact on biomedical research can be disastrous. Equally bad is the disincentive for the future generations of biomedical researchers who observe their mentors struggling to get adequate funding. How many bright young people will be turned away from careers in biomedical research? How much innovative science will be delayed or never initiated, how many new cures never realized? At a time of unprecedented challenges and remarkable technological advances that enable us to address those challenges, lack of funding is a threat to our society.

Biomedical research is an essential enterprise for our society, pursued to a very great extent in laboratories scattered throughout academic health centers by dedicated, expert scientists driven by a quest to help improve quality of life. Societies expect biomedical researchers to successfully combat the scourges of modern human life, including infectious diseases, neurodegenerative diseases, cancer, and heart diseases.

A luxury of developed economies is that we can afford to commit large percentages of our GDP to pursuing scientific research and improvements in disease prevention and cure. Our nation and others in the "developed world" have both the opportunity and the obligation to meet the challenges of improving the health of our society as well as that of those less fortunate. Simply put, in times of large federal deficits, it becomes harder to justify allotting scarce resources to individual scientists laboring in academic laboratories. Progress is often made when scientists are bucking up against prevailing opinions and are seeking to probe the dark corners of our insufficient knowledge, where our understanding is weak.

When funding for research becomes tight, the most exciting, creative, and risky science is imperiled. Understandably, when resources are limited (driven by rising federal deficits), study sections are inclined to fund incremental, less risky science.

The impact of the federal budget on science is undeniable. During the administration of George H.W. Bush (1988–1992), when federal deficits were high, NIH funding was restricted and pay lines were often below 15% (NIH grants are only funded when they score above the pay line percentile rank). During the Clinton years (1992–2000), when the federal budget was running at a surplus, the NIH budget doubled over five years, and pay lines were generally in the 25–30% range. Now, with George W. Bush in office (2000–present), federal budget deficits are again soaring, and NIH pay lines are plummeting back toward the sub-15% range.

In times of large federal deficits, it becomes harder to justify allotting scarce resources to individual scientists laboring in academic laboratories.

While one can argue the merits of tax cuts and large deficits, their negative impact on federal funding for biomedical research is quite clear. Also clear is the long-term impact on the health of the biomedical research community and, indirectly, on the health of our society both medically and economically. In the early 1990s, when obtaining funding from the NIH for biomedical research was generally regarded as a Herculean effort due to low pay lines (the term "crap shoot" is often used to describe the exercise of submitting an NIH grant application when pay lines fall below 25%), there was a generalized depression amongst biomedical researchers. Indeed, in the late 1980s and early 1990s, the total number of new and competing NIH RO1s (investigator-initiated research grants) was about 5,000 per year, a number that is generally regarded as inadequate to both sustain established research programs and provide reasonable opportunities for funding for new investigators. Following the doubling of the NIH budget (1998–2003), the number of new and competing NIH RO1s was greater than 7,000 per year. How that can be sustained in the face of the current 2% annual increase in the NIH budget is not clear. The impact can be devastating on trainees who observe their mentors, many the most senior and accomplished scientists in their respective fields, struggling to obtain funding. How many of these bright young people have abandoned research for alternative careers?

Of course, when times are tough, diversity in the biomedical research community also suffers as opportunities for those traditionally excluded from research careers (i.e., women and minorities) shrink as well. All indications are that the dark days of the early 1990s are once more upon us.

Few would argue that the peer review system is sufficiently finely tuned to be able to distinguish amongst grant applications in the 10th to 25th percentile. Admittedly, when funding is at 30%, a small number of less worthy grants will be funded. This is the price that has to be paid in order to ensure funding for most of the worthy grants. When funding falls below 20%, however, many worthy applications go unfunded.

Unfortunately, since the NIH budget was doubled, one often hears the question, what do we have to show for it? Where is the cure for cancer or heart disease or Alzheimer disease? This shortsighted assessment overlooks the phenomenal advances that are being made every day by dedicated scientists whose work is contributing to important advances that, taken together, are pushing back the shadows of ignorance. One only has to glance at the amazing discoveries reported each month in the pages of this and other scientific journals to gain an appreciation of the benefits forthcoming on a continual basis from the investment our society is making in biomedical research.

Andrew R. Marks, M.D.
Editor-in-Chief