Politics and Probabilities

Jon Lorsch
NIGMS
“Politics is the art of the possible”

Statement of Pragmatic Wisdom?

Justification for Cowardice?
“Politics is the art of the possible”

Benjamin Disraeli  Winston Churchill  Tip O’Neill
“Politics is the art of the possible”

Otto von Bismarck
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So what are our cannons?

Data!
NIGMS Strategic Plan: Data-driven Decision Making and Iterative Improvement through Evaluation and Analysis

Objective 1-1: Invest in and sustain a broad and diverse portfolio of highly meritorious research.

2. Use data-driven analyses to regularly assess the diversity and breadth of the Institute’s portfolio.

Objective 1-2: Promote the ability of investigators to pursue new research directions, novel scientific insights and innovative ideas.

3. Conduct regular analyses of NIGMS’ scientific investments to assess their efficacy, distribution and impact, and use this information to help guide programmatic and funding decisions.

5. Increase the Institute’s ability to conduct in-depth portfolio analyses and evaluation activities.

Objective 2-1: Assess Institute research training and education programs and policies to ensure that they achieve positive outcomes related to the NIGMS mission
NIGMS Office of Program Planning, Analysis and Evaluation (OPAE)

Dr. Richard Aragon
Chief, NIGMS OPAE
Application and Funding Trends

The Consolidated Appropriations Act, 2016, provides funding for the Federal Government through September 30. NIGMS has a Fiscal Year 2016 appropriation of $2.512 billion, which is $140 million, or 5.9%, higher than it was in Fiscal Year 2015. With this opportunity to expand NIGMS support for fundamental biomedical research comes a responsibility to make carefully considered investments with taxpayer funds.

Application Trends

One of the most commonly cited metrics when discussing grants is success rate, calculated as the number of applications funded divided by the number of applications received. As shown in Figure 1, the success rate for NIGMS research project grants (RPGs) increased from 24.8% in Fiscal Year 2014 to 29.6% in Fiscal Year 2015. This was due to an increase in the number of funded competing RPGs as well as a decline in the number of competing RPG applications. In contrast, in Fiscal Year 2013, applications increased while awards decreased, leading to a notable decrease in success rate. Overall, we have seen a decrease in RPG applications over the last 2 years, a trend warranting additional investigation.

![NIGMS Competing RPG Applications, Funded RPGs and Success Rates](image)

Figure 1. Number of NIGMS Competing RPG Applications, Funded Competing RPGs and Success Rates for RPGs, Fiscal Years 2004-2015. NIGMS RPG applications (blue circles, dashed line; left axis) decreased from Fiscal Years 2014 to 2015 to a 5-year low. Meanwhile, NIGMS-funded RPGs (green squares, solid line; left axis) increased in Fiscal Year 2015 to a level not seen since Fiscal Year 2007. As a result, the NIGMS RPG success rate (gray triangles, dotted line; right axis) was the second highest it has been in the past decade.
How Should We Invest the Taxpayers’ Money?

Model 1: Smaller number of bigger labs

Model 2: Larger number of moderate size labs
Productivity Does Not Scale Proportionally with Funding

3-Year-Averaged Total Annual NIH Direct Costs ($1,000s)

Number of Publications (2010-2015)

%ile Proportionality

Travis Dorsey: NIGMS OPAE
Diminishing Marginal Returns as a Function of Direct Costs

Log Publications per Million Dollars

Log Annual Total Direct Costs
Productivity Does Not Scale Proportionally with Funding

3-Year-Averaged Total Annual NIH Direct Costs ($1,000s)

Number of Publications (2010-2015)
Mean Citations per Paper Does Not Increase with Increasing NIH Direct Costs

Mean Number of Citations per Paper

3-Year-Averaged Total Annual NIH Direct Costs ($1,000s)
RCR Does Not Increase with Increasing NIH Direct Costs

RCR: George Santangelo et al., DPCPSI, Office of the Director, NIH
Cardiovascular PI Top-10 Papers by Annual Award

N=5768 CV Scientists
Costs=$19B
Papers=91,814
Highly-Cited Papers=20,471
Diminishing Scientific Returns with Lab Size

Diminishing returns with increased funding also seen in:

- NIMH (Doyle et al., 2015)
- Other U.S. funders (Gallo et al., 2014)
- Canada (Fortin and Currie, 2013)

Factors that Might Make Larger Groups Less Efficient

1. Less PI bandwidth per project
2. Less PI bandwidth per trainee
3. More PI time (and thought) spent on writing grants
4. More PI time spent on administration of grants
5. Misplaced emphasis on funding level and lab size as measures of success
Behavioral Economists Knew It All Along
How Should We Invest the Taxpayers’ Money?

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General Principles

• On average, funding four investigators at $250K each gets the taxpayers more scientific advances than funding one investigator at $1 million

• Supporting a broad and diverse portfolio builds the strongest scientific foundation of knowledge and maximizes the chances for breakthroughs

From NIGMS Strategic Plan:

- Align funding decisions with the need to create a broad and diverse research portfolio that maximizes the scientific return on taxpayers’ investments.

- Conduct regular analyses of NIGMS’ scientific investments to assess their efficacy, distribution and impact, and use this information to help guide programmatic and funding decisions.

- Pilot and assess alternative mechanisms of funding that emphasize individual investigators, rather than individual projects, to better meet NIGMS goals and objectives.

“A good lesson in keeping your perspective is: Take your job seriously but don’t take yourself seriously.”

-Tip O’Neill