Rescuing US biomedical research from its systemic flaws

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Training postdoctoral fellows. There are currently more than 40,000 postdoctoral fellows in the US biomedical research system, and the number has been increasing rapidly in recent years (\textsuperscript{2, 17}). The position has become one in which young scientists spend a significant fraction of their most productive years while being paid salaries that are quite low considering their extensive education. On the one hand, these fellows are pursuing science full time without the distractions that often come with more permanent jobs. On the other hand, for most of them, the holding pattern postpones the time when they are able to explore their own ideas in independent careers.
Topics to be Discussed

- **Individual Fellowship Programs**
  - Federal
    - National Institutes of Health (F32)
  - Voluntary Health Organizations, Professional Societies, Foundations

- **Scoring and Review Criteria for Fellowship Applications**

- **Components of a Fellowship Application**

- **Funding Programs after the Fellowship**

- **Approaches for Competitive Applications**

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Types of Awards

- Individual fellowships
- Training grants
- Career transition awards
- Career development awards
- Research grants
- Program Projects
- Loan Repayment Program
- Administrative supplements
- Cooperative agreements
- Institutional Clinical & Translational Science Award (CTSA)
- Subcontracts
- Contracts
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Not All Funding Opportunities Are the Same

- **Different mission statements**
  - Fellowships
  - Career development (K’s)/ Scholar awards
  - Research project (R’s)

- **Different funding**
  - Stipend/Salary
  - Pilot awards vs. Comprehensive research costs

- **Different time frames**
  - Not renewable: 5 years (K’s), 3 years (F’s), 2 years (T’s)
  - Renewable: 4 years-5 years (R01) each competitive period
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Timeline of Funding for Junior Investigators

Graduate School

- Individual Fellowship Training Grant
- Mentor’s Research Grant

Post-doctoral Years

- Individual Post-doc Fellowship
- Institutional T32 Post-doc Training Grant slot
- Mentor’s Research Grant

Instructor/Assistant Professor

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Timeline of Funding for Junior Investigators

- Medical School
- Internship/Residency
- Fellowship – Research Years
- Instructor/Assistant Professor

Short term Training
Research Support
Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot

Year-long Enhancement Programs
MD/PhD Fellowship or Institutional T32

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Institutional Training Grant (NIH-T32)

- Pre-docs/Post-docs selected by institution
- Research training in specific area
- Defined number of slots
- Stipend, health fees, tuition, travel

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Individual Post-doc Fellowship

- Supports specific individual
- Stipend, health fees, tuition, travel
- NIH: F32

Review criteria:
- Individual fellow
- Mentor
- Research project
- Research environment

Post-doc Fellowships (F32s)
Applications, awards, and success rates
Training Grants and Fellowships: Pre- and Post-Doctoral Positions
Individual Fellowships

Non-government, non-profit agencies

• Voluntary Health Organizations
• Professional Societies
• Private Foundations
Post-doc: Individual Fellowship

- Voluntary Health Organizations, Foundations, Professional Societies -

- American Cancer Society
- American Heart Association (Founders)
- American Kidney Fund
- American Liver Foundation
- Daland Fellowships in Clinical Investigation
- Helen Hay Whitney Foundation
American Heart Association (Founders Affiliate)

Postdoctoral Fellowship Program

- Cardiovascular function and disease and stroke
- Clinical, basic science, bioengineering, biotechnology, epidemiological, behavioral, community, and public health

• Funding
  • Stipend/Salary: $42,000-$55,300; Fringe Benefits: $1,000

• Award Duration: 2 years

• Citizenship
  • U.S. citizen/ Permanent resident/ Pending permanent resident/ Visas (e.g. F1, H1-B, J-1, O-1)

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American Assoc for the Study of Liver Diseases - Clinical and Translational Research Fellowship

- Support for an investigator from outside North America to perform clinical research in US in a liver-related area
- One one-year award of $75,000 will be funded
- MD or equivalent and/or a PhD
- MD within four years of completing residency or fellowship training, or, if a PhD, within four years of the receipt of the degree
- Student/trainee visa to the US
The Helen Hay Whitney Foundation
Postdoctoral Research Fellowships

- Supports *early* postdoctoral research training in all basic biomedical sciences
- Candidates who hold, or are in the final stages of obtaining PhD, MD, or equivalent - candidates who have no more than one year of postdoctoral research experience
- 3-year fellowships (<5% success rate)
- Stipend: $51,000-$53,000; Research Allowance: $1,500
- US and foreign citizens

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Improving graduate student and postdoctoral training

- A. Put individual development plans in place for all trainees
- B. Reduce the length of graduate training
- C. Provide F30 and F31 awards from all Institutes/Centers
- D. Increase postdoctoral stipends and consider policies on benefits
- E. Increase support for K99/R00 and shorten eligibility period
- F. Increase support for Early Independence Awards

http://acd.od.nih.gov/bwf.htm

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- **Approaches for Competitive Applications**
## NIH's Evaluation System

9-point rating scale (1=exceptional; 9=poor)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Score</th>
<th>Descriptor</th>
<th>Strengths/Weaknesses</th>
</tr>
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<tbody>
<tr>
<td><strong>High Impact</strong></td>
<td>1</td>
<td>Exceptional</td>
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<tr>
<td></td>
<td>2</td>
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<tr>
<td></td>
<td>3</td>
<td>Excellent</td>
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<tr>
<td><strong>Moderate Impact</strong></td>
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<tr>
<td></td>
<td>5</td>
<td>Good</td>
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<tr>
<td></td>
<td>6</td>
<td>Satisfactory</td>
<td></td>
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<tr>
<td><strong>Low Impact</strong></td>
<td>7</td>
<td>Fair</td>
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<tr>
<td></td>
<td>8</td>
<td>Marginal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Poor</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>Score</th>
<th>Descriptor</th>
<th>Additional Guidance on Strengths/Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>1</td>
<td>Exceptional</td>
<td>Exceptionally strong with essentially no weaknesses</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Outstanding</td>
<td>Extremely strong with negligible weaknesses</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Excellent</td>
<td>Very strong with only some minor weaknesses</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>Very Good</td>
<td>Strong but with numerous minor weaknesses</td>
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<tr>
<td></td>
<td>5</td>
<td>Good</td>
<td>Strong but with at least one moderate weakness</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Satisfactory</td>
<td>Some strengths but also some moderate weaknesses</td>
</tr>
<tr>
<td>Low</td>
<td>7</td>
<td>Fair</td>
<td>Some strengths but with at least one major weakness</td>
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<td>8</td>
<td>Marginal</td>
<td>A few strengths and a few major weaknesses</td>
</tr>
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<td></td>
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<td>Poor</td>
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</tr>
</tbody>
</table>

**Minor Weakness:** An easily addressable weakness that does not substantially lessen impact

**Moderate Weakness:** A weakness that lessens impact

**Major Weakness:** A weakness that severely limits impact
Impact Score

- Preliminary Impact Scores determine which applications discussed at study section
- Impact Score given by each member of the study section
- Overall Impact Score (for discussed applications): Mean of reviewers’ Impact Scores x10
- 81 possible overall Impact Scores (10 – 90, whole numbers)
Overall Impact/Merit

Write a paragraph summarizing the factors that informed your Overall Impact score.
Overall Impact/Merit Score

Reviewer’s assessment “that the fellowship will enhance the candidate's potential for, and commitment to, an independent scientific research career”

“Research project that is integrated with the training plan”

“Review will emphasize the applicant’s potential for an independent, scientific research career, the applicant’s need for the proposed training, and the degree to which the research project and training plan, the sponsor(s), and the environment will satisfy those needs.”


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Reviewers will consider each of the five review criteria below in the determination of scientific and technical merit, and give a separate score for each.

1. **Fellowship Applicant**

   - **Strengths**
   - 
   - **Weaknesses**
   - 

2. **Sponsors, Collaborators, and Consultants**

   - **Strengths**
   - 
   - **Weaknesses**
   - 

3. **Research Training Plan**

   - **Strengths**
   - 
   - **Weaknesses**
   - 

## 4. Training Potential

### Strengths
- 

### Weaknesses
- 

## 5. Institutional Environment & Commitment to Training

### Strengths
- 

### Weaknesses
- 

1. Fellowship Applicant

- “Are the applicant's academic record and research experience of high quality?
- Does the applicant have the potential to develop into an independent and productive researcher in biomedical, behavioral or clinical science?
- Does the applicant demonstrate commitment to a career as an independent researcher in the future?”

2. Sponsors, Collaborators, and Consultants

■ “Are the sponsor(s’) research qualifications (including recent publications) and track record of mentoring individuals at a similar stage appropriate for the needs of the applicant?

■ Is there evidence of a match between the research interests of the applicant and the sponsor(s)?

■ Do the sponsor(s) demonstrate an understanding of the applicant’s training needs as well as the ability and commitment to assist in meeting these needs?”
2. Sponsors, Collaborators, and Consultants

- “Is there evidence of adequate research funds to support the applicant’s proposed research project and training for the duration of the fellowship?

- If a team of sponsors is proposed, is the team structure well justified for the mentored training plan, and are the roles of the individual members appropriate and clearly defined?

- Are the qualifications of any collaborator(s) and/or consultant(s), including their complementary expertise and previous experience in fostering the training of fellows, appropriate for the proposed project?”
3. Research Training Plan

- “Is the proposed research plan of high scientific quality, and is it well integrated with the applicant's/proposed training plan?
- Is the research project consistent with the applicant's stage of research development?
- Is the proposed time frame feasible to accomplish the proposed research training?
- Based on the sponsor’s description of his/her active research program, is the applicant’s proposed research project sufficiently distinct from the sponsor’s funded research for the applicant’s career stage?”

4. Training Potential - Post-docs (F32)

- “Do the proposed research project and training plan have the potential to provide the applicant with the requisite individualized and mentored experiences that will develop his/her knowledge and research and professional development skills?
- Does the training plan take advantage of the applicant’s strengths, and address gaps in needed skills?
- Does the training plan document a clear need for, and value of, the proposed training (for the applicant)?
- Does the proposed research training have the potential to serve as a sound foundation that will clearly lead the fellow to an independent and productive research career?”

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5. Institutional Environment & Commitment to Training

- “Are the research facilities, resources (e.g. equipment, laboratory space, computer time, subject populations), and training opportunities (e.g. seminars, workshops, professional development opportunities) adequate and appropriate?

- Is the institutional environment for the applicant’s scientific development of high quality? Is there appropriate institutional commitment to fostering the applicant's mentored training toward his/her research career goals?”
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  - Federal
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PHS Fellowship Supplemental Form

B. Research Training Plan

1. Introduction to Application
   (for RESUBMISSION applications only)

2. * Specific Aims

3. * Research Strategy

4. Progress Report Publication List
   (for RENEWAL applications only)

B.2. Specific Aims (1 page)

- Goals of the proposed research
- Expected outcome(s)
- Impact of proposed research on your field(s)
- Specific objectives
  - Test of a stated hypothesis
  - Create a novel design
  - Solve a specific problem
  - Challenge an existing paradigm or clinical practice
  - Address a critical barrier
  - Develop new technology
B.2. Research Strategy (6 pages total)

(a) Significance

- “Importance of the problem or critical barrier to progress in the field that the proposed project addresses”
- “How the proposed project will improve scientific knowledge, technical capability, and/or clinical practice”
- “How the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved”

B.2. Research Strategy (6 pages total)

■ (b) Innovation - do not include

■ (c) Approach

■ “Overall strategy, methodology, and analyses to be used”

■ “How the data will be collected, analyzed, and interpreted”

■ “Potential problems, alternative strategies, and benchmarks for success”

■ Strategies “to establish feasibility, and address the management of any high risk aspects”

■ Preliminary studies and results

C. Additional Information

7. * Goals for Fellowship Training and Career

8. * Activities Planned Under This Award

9. Doctoral Dissertation and Other Research Experience
C.7. Goals for Fellowship Training and Career (1 page)

- Overall career goals
- How the proposed research training will help the applicant reach these goals
- Identify specific “skills, theories, conceptual approaches, etc.” that will be acquired or expanded upon during the fellowship period
  - Didactics (e.g. statistics)
  - Technical Skills
  - Career Development Skills (e.g. presentations, writing)
C.8. Activities Planned Under This Award (1 page)

- Specific fellowship activities (by year)
  - Research
  - Didactics
  - Teaching
- Estimate % of time devoted to each activity (each year should total 100%)
- Relate non-research activities to the proposed research training

C.9. Doctoral Dissertation and Other Research Experience (2 pages)

- In chronological order, summarize previous research and scientific experiences (not courses)

- Post-doctoral Fellows:
  - Describe previous scientific areas studied and findings
  - Specify which previous experiences were part of a doctoral thesis and which were part of a previous postdoctoral period

D. Sponsor(s) and Co-Sponsor(s)

* Sponsor(s) and Co-Sponsor(s) Information
D. Sponsor(s) and Co-Sponsor(s) (6 pages)

- **a. Research Support Available**
  - Table containing detailed information on all current and pending research and research training support available to the applicant

- **b. Sponsor's/Co-Sponsor’s Previous Fellows/Trainees**
  - Total number of predoctoral and postdoctoral fellows previously mentored. For representative five, provide information on current positions


D. Sponsor(s) and Co-Sponsor(s) (6 pages)

- c. Training Plan, Environment, Research Facilities
  - Fellow-specific research training plan (e.g. didactics, collaborations with other scientists)
  - Research environment (e.g. core facilities, equipment, research patient population)
  - Relationship of the Fellow’s research/career goals to the proposed research training plan and specific new skills and techniques to be acquired

D. Sponsor(s) and Co-Sponsor(s) (6 pages)

- **d. Number of Fellows/Trainees to be Supervised During the Fellowship**
  - Number of pre- and postdoctoral fellows to be mentored

- **e. Applicant's Qualifications and Potential for a Research Career**
  - Relate applicant’s academic record and previous research experiences to the proposed research training opportunity
  - Describe how the proposed research training plan, and your expertise as a mentor, will “assist in producing an independent researcher”


Other Attachments

- **Additional Educational Information**
  - Resources available for research training and career development (e.g. from the Office of Postdoctoral Affairs)
  - Provided by Mentor or Department (include name/title)

- **Collaborators, Advisors, Consultants**
  - Letter describing their role in applicant’s research training, career development, and future career goals


Letters of Reference

- Include a list of Referees in the Cover Letter
- 3-5 Letters of References are required
- Individuals who know you well and know you well from a research perspective
- Individuals who can provide “meaningful comments about your qualifications for a research career”
- Mentor(s) cannot be one of the confidential Letters of Reference ("letter" in main body of application)

Letters of Reference

- Helpful to include at least one referee who is not in your current department.

- Postdoctoral F32 applications: “References from graduate/medical school are preferred over those from undergraduate school.”

- Postdoctoral F32 applications: Explanation required if not including a letter from Ph.D. dissertation mentor

NIH Sites of Interest

- F32 Application Announcement
  [Link](http://grants.nih.gov/grants/guide/pa-files/PA-14-149.html)

- Fellowship Application Instructions
  [Link](http://grants.nih.gov/grants/funding/424/index.htm)

- Frequently Asked Questions
  [Link](http://grants.nih.gov/training/faq_fellowships.htm)

- Guidelines for Reviewers, Review Critique Fill-able Templates, and Review Criteria and Considerations
  [Link](http://grants.nih.gov/grants/peer/reviewer_guidelines.htm)

- Example of an F Application Critique

Jaime S. Rubin, Ph.D.; [Link](http://grantscourse.columbia.edu)
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Timeline of Funding for Junior Investigators

Graduate School
- Individual Fellowship Training Grant
- Mentor’s Research Grant

Post-doctoral Years
- Individual Post-doc Fellowship
- Institutional T32 Post-doc Training Grant slot
- Mentor’s Research Grant

Instructor/Assistant Professor

Career Transition Awards
NIH: Pathway to Independence Award

- Career Transition Award (K99/R00)
- No citizenship requirement
- Applicants must:
  - Have earned a clinical or research doctorate;
  - Have no more than 4 years of research experience since completing the requirements of the doctoral degree
  - Have not been the principal investigator of an NIH research grant (e.g., R01, R03, R21), career development award (e.g., K01, K07, K08, K23, K25), other peer-reviewed NIH or non-NIH research grant over $100,000 direct costs per year, or have been a project leader on a sub-project of a program project (P01) or a center (P50) grant.

1-2 years as a mentored **K Award** for “post-docs”
- Funding level is Institute-specific
  - NHLBI, NIDDK, NIA, NICHD: $75K for salary plus fringe benefits, $25K for research support (+ 8% I.C.)
- 75% effort

3 years as a **Research Award** for independent investigators
- Total/year: = $249,000 (salary and research expenses)
  - D.C. + institution’s I.C. rate
- Must have an independent research position

Career Transition Awards

JDRF: Advanced Postdoctoral Fellowships

- Provides an opportunity to receive full-time research training and to assist awardees in transitioning from a fellowship to an independent (faculty-level) position
- First degree (PhD, MD, DMD, DVM, or equivalent) received no more than 5 years before the fellowship
- $90,000 per year for up to 3 years
- **Transition Award**: Optional transition year in which awardees may request funding support for their first year as a faculty member (up to $110,000 for one year)

Timeline of Funding for Junior Investigators

- Short term Training
- Medical School
  - Year-long Enhancement Programs
  - MD/PhD Fellowship or Institutional T32

- Research Support
  - Internship/Residency

- Fellowship – Research Years
  - Individual Post-doc Fellowship or Institutional T32 Post-doc Training Grant slot

- Instructor/Assistant Professor
  - Career Transition Awards

Career Transition Awards

BWF: Career Awards for Medical Scientists

- Supports physician-scientists to bridge advanced postdoctoral/fellowship training and the early years of faculty appointment
- Must hold an M.D., D.D.S., or D.V.M.
- 75% effort to research-related activities
- Funding: $700,000 over five years
  - **Postdoctoral/Fellowship Portion:** Years 1 and 2
    Annual Total: $95,000
  - **Faculty Portion** of the Award: Years 3-5
    Annual Total: $170,000

American Heart Association (National)

Career Fellow-to-Faculty Transition Transition Award

- For physician-scientists
- Provides funding for the period of career development which spans the completion of research training through the early years of the first faculty/staff position

- **Training stage:** Maximum of $65,000 per year
- **Faculty stage:** Maximum of $132,000 per year
- Award Duration: 5 years

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R01 Research Award

Independent Investigator

Funds research project
- Salaries of PI and other research personnel
- Supplies, reagents, etc
- Animal costs
- Patient care costs
- Core facilities
- Page charges for publications

Multi-Year (4yrs – 5yrs)
Renewable (e.g. original grant + 2 renewals = 15yrs)
R01 Research Grant

- Supports a discrete, specified project
- “Comprehensive” funding
- Modular budgets up to $250,000/year
- Multi-year
- Flexibility

Most of the research that NIH supports is through this funding mechanism
Exploratory/ Developmental Grants (R21)

- Encourages new, exploratory and developmental research projects by providing support for the early stages of project development. Sometimes used for pilot and feasibility studies.
- 2 years of funding
- Budget: $275,000 (Direct Costs) over two years
- Investigator-initiated R21 studies not funded by all Institutes
Small Research Grants (R03)

- Supports, e.g.:
  - Pilot or feasibility studies;
  - Collection of preliminary data;
  - Secondary analysis of existing data;
  - Small, self-contained research projects;
  - Development of new research technology.

- 2 years of funding
- Budget: Direct costs up to $50,000/yr
- Not renewable
- Some Institutes only accepts applications in response to their specific funding opportunity announcements.
Number of Scored Applications from First-time Investigators are Dropping

-535 Applications

+339 Applications
### Challenging Times for All Researchers

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<th>2007</th>
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<tr>
<td>Overall success rate for NIH RO1* Proposals</td>
<td>32%</td>
<td>24%</td>
</tr>
<tr>
<td>Success rate on first submission</td>
<td>29%</td>
<td>12%</td>
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### Especially for Young Investigators

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<tr>
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<th>Then 1990</th>
<th>Now 2007</th>
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<tbody>
<tr>
<td>Age at first Ro1* grant</td>
<td>39</td>
<td>43</td>
</tr>
<tr>
<td>% of Ro1s* that go to first-time investigators</td>
<td>29%</td>
<td>25%</td>
</tr>
</tbody>
</table>

*R01 Equivalents: RO1, R29, R37  
*Source: National Institutes of Health
Figure 1. Average Age of Principal Investigators with MD, MD-PhD, or PhD at the time of First R01 Equivalent Award from NIH, Fiscal Years 1980 to 2011
“Over the past three decades, we’ve seen profound shifts in the average age at which a principal investigator receives their first R01. During the period from 1980 to 2001, the average age increased nearly 0.3 years per year. Since that time, the average age at first R01 award has leveled off near 42 for PhDs. It is higher for researchers with an MD or an MD/PhD.” [Dr. Sally Rockey, NIH Deputy Director for Extramural Research (2/3/12)]
Age Distribution of NIH RPG Investigators: 1980

Average Age
New R01 Investigator: 37.2

Sources: IMPAC II Current and History Files
Age Distribution of NIH RPG Investigators: 2006

Average Age
New R01 Investigator: 42.2

Sources: IMPAC II Current and History Files
Preliminary Projection of Age Distribution of NIH RPG Investigators: 2020

Sources: IMPAC II Current and History Files and Preliminary Demographic Projection Model
NIH R01 Principal Investigators: Age 36 and Younger / Age 66 and Older

[Graph showing the percentage of NIH R01 Principal Investigators aged 36 and younger and 66 and older over fiscal years from 1980 to 2010.]
Op-Ed Contributor

Young, Brilliant and Underfunded

By ANDY HARRIS

We'll never know what medical breakthroughs were missed because young scientists were not provided with resources.

Comments

The New York Times

OCT. 2, 2014
A study for the National Bureau of Economic Research from 2005 examined the age at which over 2,000 Nobel Prize winners and other notable scientists in the 20th century came up with the idea that led to their breakthrough. Most were between 35 and 39. Yet the median age of first-time recipients of R01 grants, the most common and sought-after form of N.I.H. funding, is 42, while the median age of all recipients is 52. More people over 65 are funded with research grants than those under age 35.
Early Stage Investigator (ESI)

- Has not been previously been awarded “significant NIH independent research award”
  - Includes R01’s, projects on P01
  - Does not include: R03’s, R21’s, F’s, K’s, loan repayment
- Within 10 years of terminal research degree/completion of medical residency
  - Extensions permitted
    (family care, additional clinical training)
Early Stage Investigators: e.g. NHLBI

- Separate R01 payline for Early Stage Investigators:
  - 5 percentile points above the regular A0 R01 payline
- Applications that are > 5 but ≤ 10 percentile points above the regular R01 payline
  - May undergo expedited administrative review
# Early Stage Investigators: NHLBI

<table>
<thead>
<tr>
<th>Grant Program</th>
<th>Percentile</th>
<th>Priority Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R01</td>
<td>12.0</td>
<td></td>
<td>Research Project Grant</td>
</tr>
<tr>
<td>ESI</td>
<td>22.0*</td>
<td></td>
<td>Early Stage Investigators</td>
</tr>
</tbody>
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*Summary Statement issues must be satisfactorily resolved on applications >17 percentile.

FY14

http://www.nhlbi.nih.gov/funding/policies/operguid.htm
Early Stage Investigators: NIDDK

For FY 2014 NIDDK is establishing a nominal “payline” for new (Type 1) and renewal or competing continuation (Type 2) R01 applications of 13th percentile. Most R01 applications which have a primary assignment to NIDDK and which request less

establishing a nominal payline for R01 applications submitted by ESIs at the 18th percentile. In addition, when possible and appropriate the full period of support recommended will be awarded.

FY14


Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Research Project Grants: Applications, Awards, and Success Rates
R01-Equivalent grants, New (Type 1)
Success rates, by career stage of investigator
Topics to be Discussed

- **Individual Fellowship Programs**
  - Federal
    - National Institutes of Health (F32)
    - Voluntary Health Organizations, Professional Societies, Foundations

- **Scoring and Review Criteria for Fellowship Applications**

- **Components of a Fellowship Application**

- **Funding Programs after the Fellowship**

- **Approaches for Competitive Applications**

When Preparing an Application:

- Read instructions
- Never assume that reviewers “will know what you mean”
- Refer to literature thoroughly and thoughtfully
- Explicitly state the rationale of the proposed investigation
- Include well-designed tables and figures
- Present an organized, lucid write-up

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Elements of a Good Proposal

- Feasible
- Relevant
- Unique
- Innovative
- Clear
- Brief
- Consistent
Investigator

- Competent
- Enthusiastic
- Thorough
- Professional
Anticipate Questions and Answer them before they are asked

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Bell Curve of Reviewer’s Grant Applications

Great

Definitely do not fund

Fine

Definitely fund

Great

Jaime S. Rubin, Ph.D.; http://grantscourse.columbia.edu
Poor Statistics
Research Resources not Adequately Described
Career Development/Research Training Plan not Comprehensive
Figure Caption Font too Small
All Components of the Application are as Strong as Possible
Common Problems with Grant Applications from New Investigators

- Overly ambitious
- Not independent of previous mentor’s research
- Fishing expedition
- Not hypothesis driven
- Descriptive, not mechanistic project
- Unfocussed
- No or insufficient preliminary data
- Unrealistic budget
- Methodologies beyond the expertise of investigator or research team
Good Luck!