Extramural Support for the Career Development of Physician-Scientists and Best Practices for Competitive Grant Applications

- Howard Hughes Medical Institute -
- Medical Research Fellows Program -

September 16, 2017

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Dept. of Medicine
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Columbia University

Course: "Funding and Grantsmanship for Research and Career Development Activities"
http://grantscourse.columbia.edu/

NIH National Institutes of Health
Turning Discovery Into Health

ADVISORY COMMITTEE TO THE DIRECTOR

ACD Physician-Scientist Workforce

Working Group Reports

- Physician-Scientist Workforce Working Group Report, June 2014 (PDF – 6.2MB) pdf
- Executive Summary of the Physician-Scientist Workforce Working Group Report (June 2014) (PDF – 408KB) pdf
- Physician Scientist Workforce Working Group Presentation at the ACD meeting on June 6, 2014 (PDF – 1.65MB) pdf

https://acd.od.nih.gov/working-groups/psw.html

Topics to be Discussed

- **Funding Agencies**
  - Federal
    - National Institutes of Health
  - Voluntary Health Organizations, Professional Societies, Foundations, Industry, Other
- **Types of Awards**
  - Fellowships (F's), Training grants (T's), Career Transition Awards, Research grants,
- **Planning & Organizing a Research Proposal**

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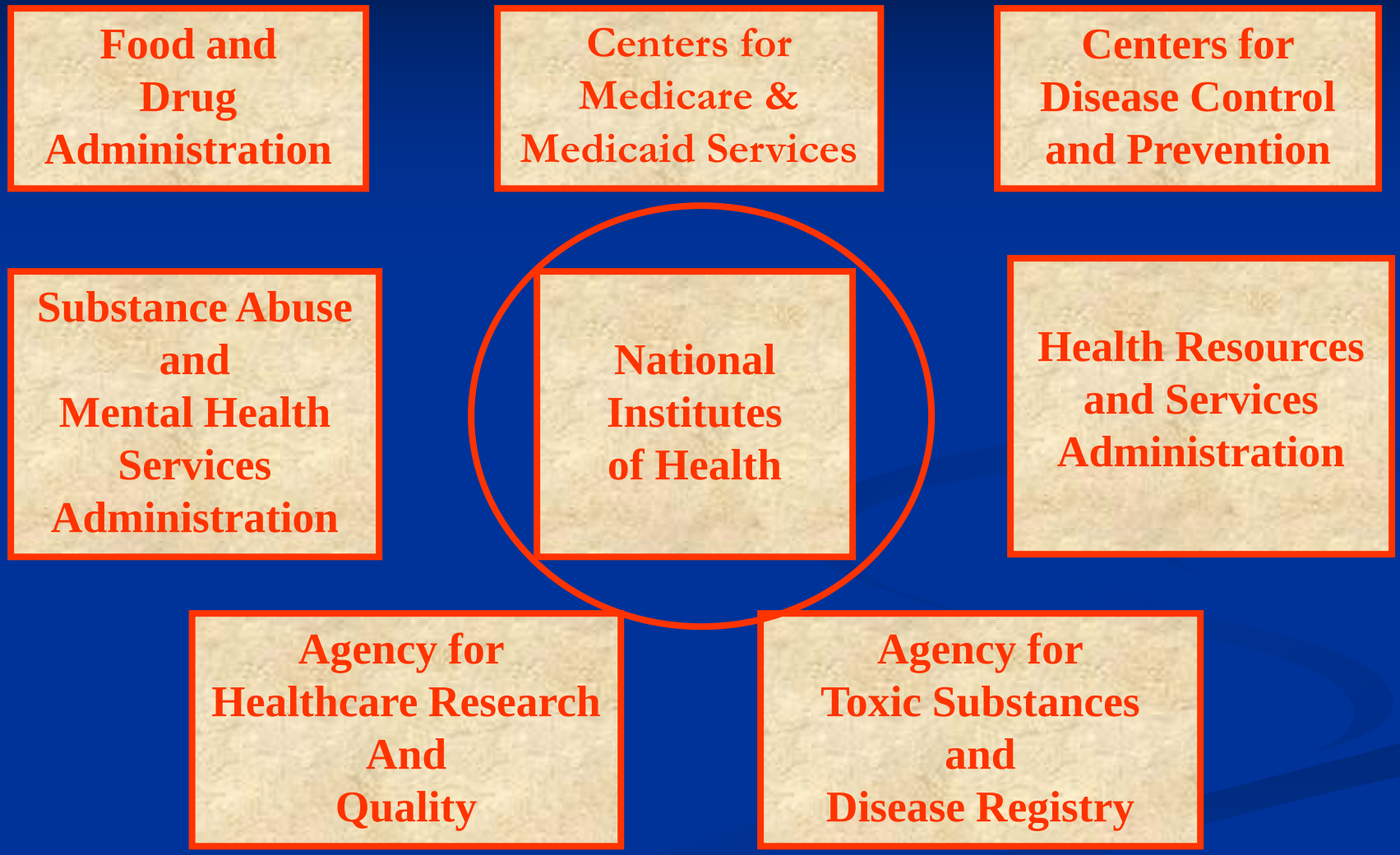
U.S. Dept. of Health and Human Services



Adapted from: NIH (DRG) - Peer Review of NIH Research Grants Applications

National Institutes of Health

National Cancer Institute	National Eye Institute	National Heart, Lung, & Blood Institute	National Human Genome Research Inst	National Institute on Aging
National Inst of Alcohol Abuse & Alcoholism	National Inst of Allergy & Infectious Diseases	National Inst of Arthritis & Musculoskeletal & Skin Diseases	National Institute of Child Health & Human Development	National Inst on Deafness & other Communication Disorders
National Inst of Dental & Craniofacial Research	National Institute of Diabetes & Digestive & Kidney Diseases	National Institute on Drug Abuse	National Institute of Environmental Health Sciences	National Institute of General Medical Sciences	National Inst of Biomedical Imaging and Bioengineering
National Institute of Mental Health	National Inst of Neurological Dis and Stroke	National Institute of Nursing Research	National Library of Medicine	National Ctr for Complementary & Integrative Health	National Inst on Minority Health & Health Disparities
National Ctr Adv Translational Sciences	John E. Fogarty International Center	Office of the Director	Center for Scientific Review	Center for Information Technology	NIH Clinical Center

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Types of Awards

- **Individual fellowships**
- **Training grants**
- **Career transition awards**
- **Career development awards**
- Research grants
- Program Projects
- Administrative supplements
- Cooperative agreements
- **Institutional Clinical & Translational Science Award (CTSA)**
- Subcontracts
- Contracts
- **Loan Repayment Program**

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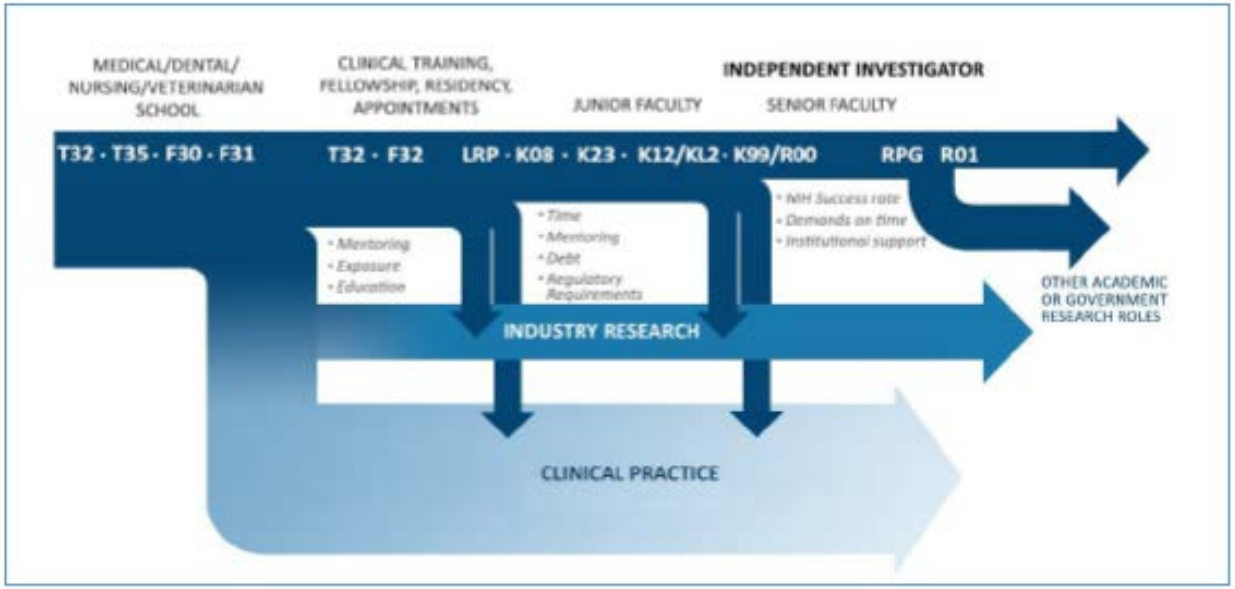
Not All Funding Opportunities Are the Same

- **Different mission statements**
  - Fellowships (F's)/Training grants (T's)
  - 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: e.g. 5 years (K's), 3 years (F's), 2 years (T's)
  - Renewable: 4years-5years (R01) each competitive period

Physician-Scientist Pathway



Timeline of Funding for Junior Investigators

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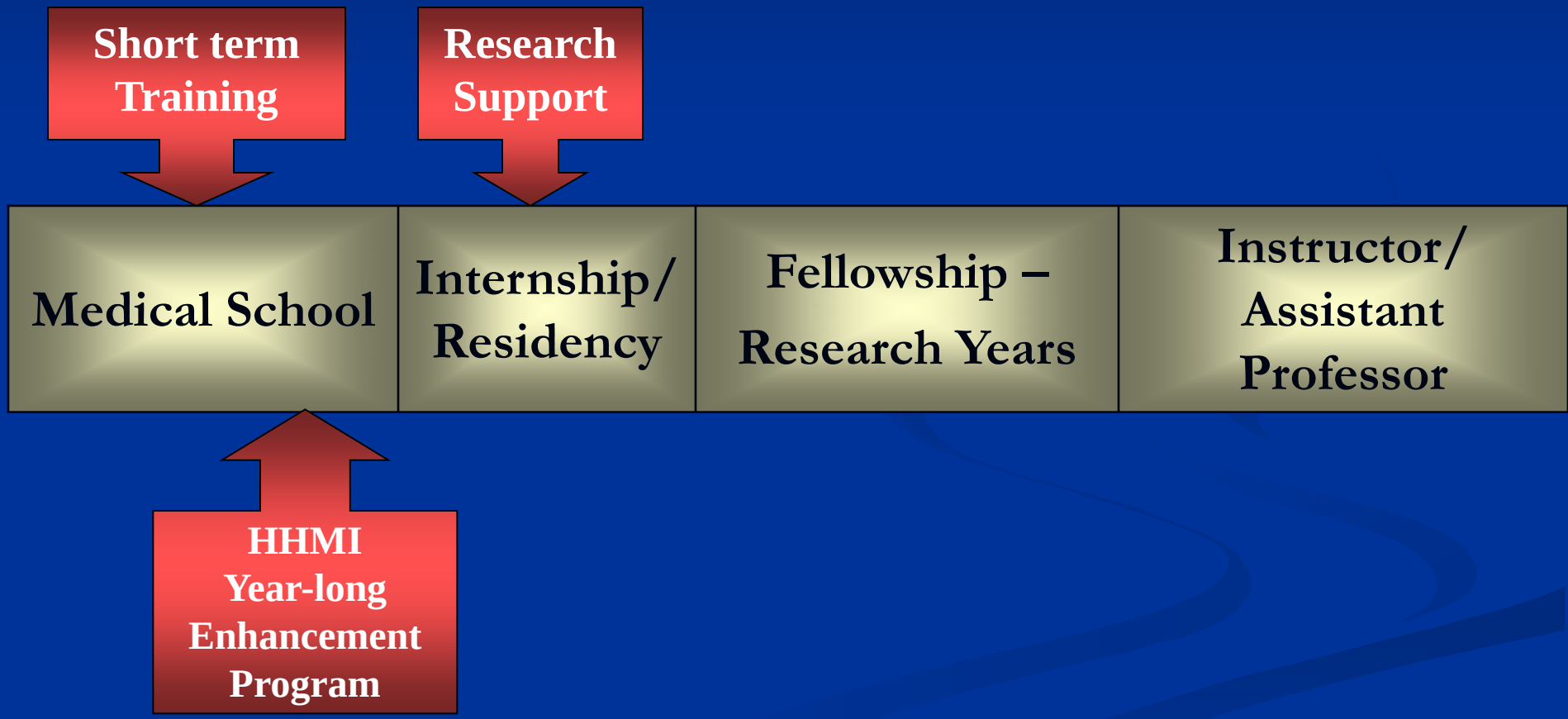


Residents - Research

- **American Medical Association Foundation**
  - Seed Grant Research Program - Supports research in: Cardiovascular/Pulmonary Diseases, HIV/AIDS, Pancreatic Cancer, and Neoplastic Diseases
- **American College of Gastroenterology/ ACG Institute for Clinical Research & Education**
  - Clinical Research Awards
- **American Academy of Pediatrics**
  - Resident Grant

Residents - Research

- **American Society of Hematology**
  - HONORS (Hematology Opportunities for the Next Generation of Research Scientists)
- **American College of Surgeons**
  - Resident Research Scholarship
- **American Academy of Otolaryngology - Head and Neck Surgery Foundation**
  - Resident Research Award

Residents - Travel

American Heart Association: Travel Stipends to Scientific Sessions

- Council on:
  - Arteriosclerosis, Thrombosis and Vascular Biology (ATVB)
  - Basic Cardiovascular Sciences (BCVS)
  - Cardiopulmonary, Critical Care, Perioperative and Resuscitation (3CPR)
  - Cardiovascular Disease in the Young (CVDY)
  - Cardiovascular Radiology and Intervention (CVRI)
  - Cardiovascular Surgery and Anesthesia (CVSA)
  - Clinical Cardiology (CLCD)
  - Functional Genomics and Translational Biology (FGTB)
  - Peripheral Vascular Disease (PVD)

Residents - Research

Stimulating Access to Research in Residency (StARR)

National Heart, Lung, and Blood Institute (NHLBI)
National Cancer Institute (NCI)
National Institute of Allergy and Infectious Diseases (NIAID)

The purpose of this program is to recruit and retain outstanding, postdoctoral-level health professionals who have demonstrated potential and interest in pursuing careers as clinician-investigators. To address the growing need for this critical component of the research workforce, this funding opportunity seeks applications from institutional programs that can provide outstanding mentored research opportunities for Resident-Investigators and foster their ability to transition to individual career development research awards. The program will support institutions to provide support for up to 2 years of research conducted by Resident-Investigators in structured programs for clinician-investigators with defined program milestones.

https://grants.nih.gov/grants/guide/rfa-files/RFA-HL-18-023.html

Residents - Research

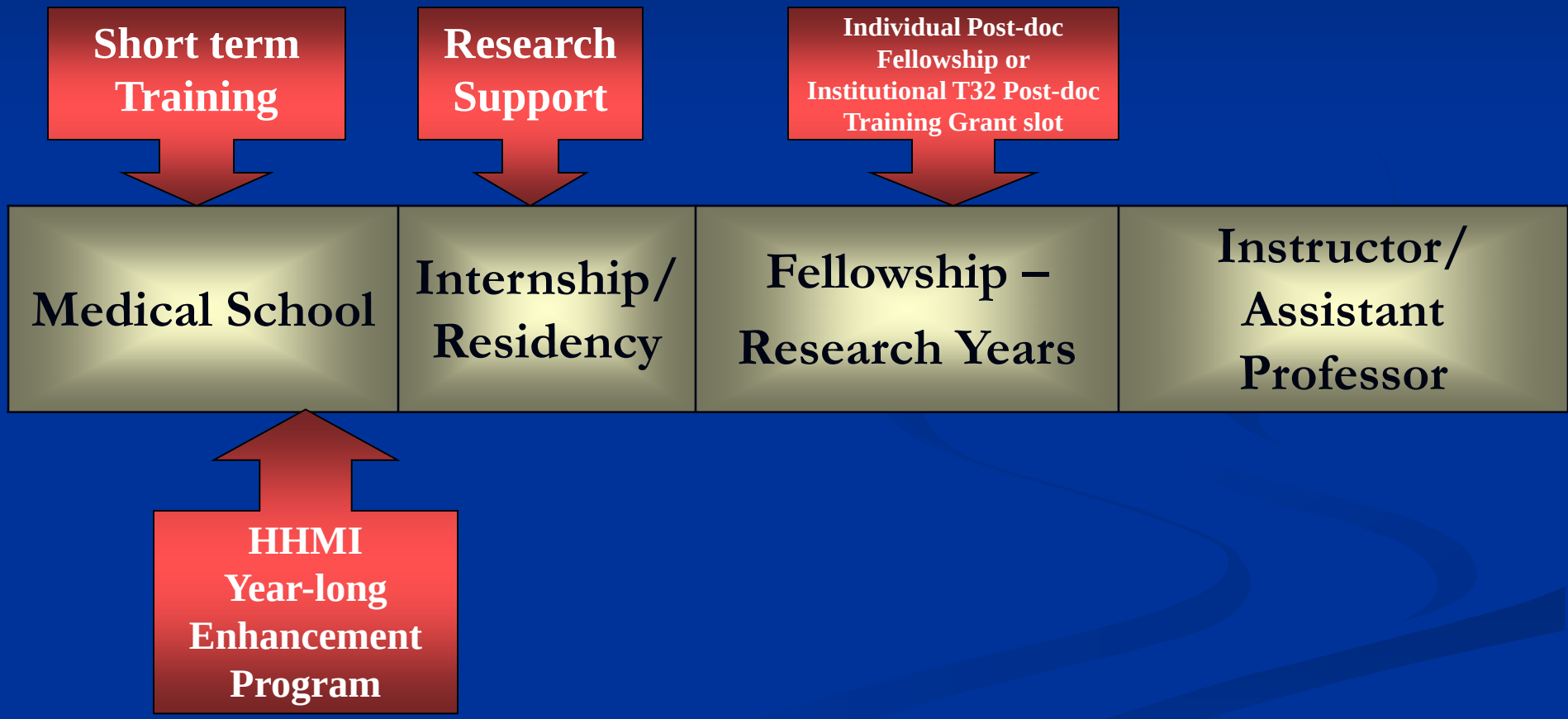
National Institute of Neurological Disorders and Stroke

NINDS Research Education Programs for Residents and Fellows in Neurology, Neurosurgery, Neuropathology, Neuroradiology and Emergency Medicine (R25)

"Research education and preparation of clinical residents and fellows that will foster careers as physician-scientists…. Participants in the research education program must be residents or fellows, typically in neurology, neurosurgery, neuropathology, neuroradiology, anesthesiology or emergency medicine, who will conduct research within the mission of NINDS."

https://grants.nih.gov/grants/guide/pa-files/PAR-13-384.html

Timeline of Funding for Junior Investigators



Post-doc: Institutional Training Grant (NIH-T32)

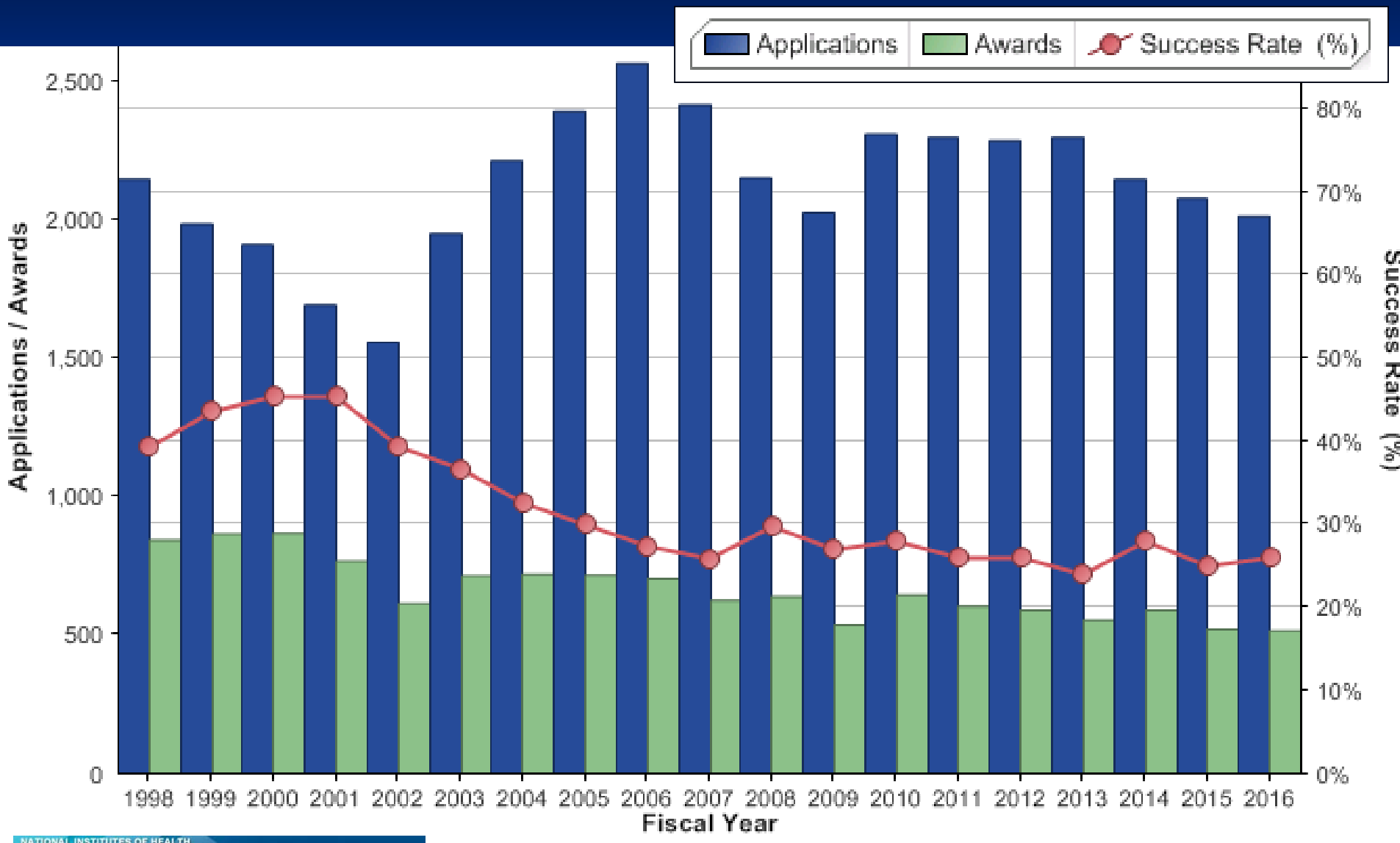
- Post-docs selected by institution
- Research training in specific area
- Defined number of slots
- Stipend, health fees, tuition, travel

Do your fellowship programs of interest have a T32?

Post-doc: Individual Fellowship

- Supports specific individual
- Stipend, health fees, tuition, travel
- NIH: F32
- Review criteria:
  - Individual fellow
  - Mentor
  - Research project
  - Research environment

Post-doc Fellowships (F32's)
Applications, awards, and success rates

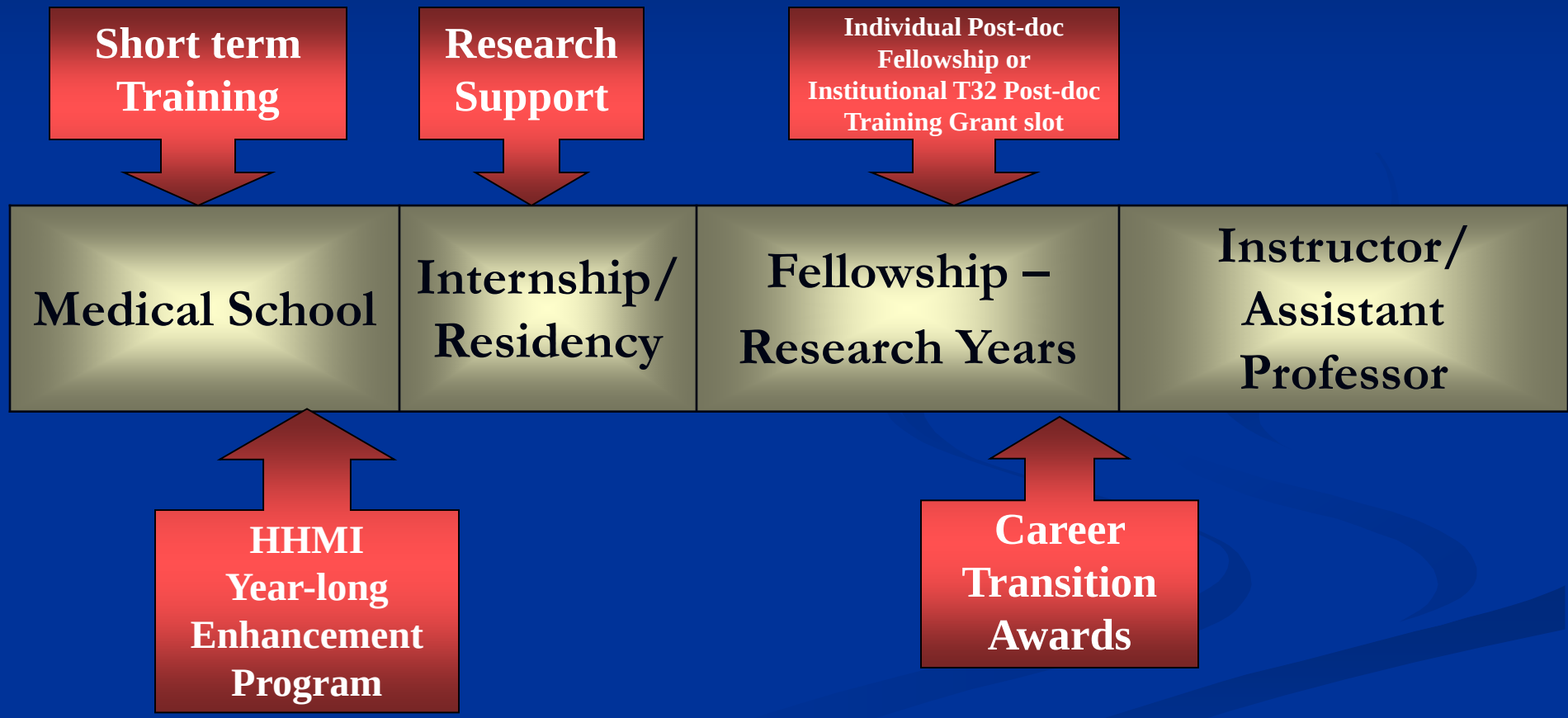


Post-doc: Individual Fellowship

- Voluntary Health Organizations, Foundations, Professional Societies -

- American Cancer Society
- American Heart Association
- American Kidney Fund
- American Liver Foundation
- Helen Hay Whitney Foundation

Timeline of Funding for Junior Investigators

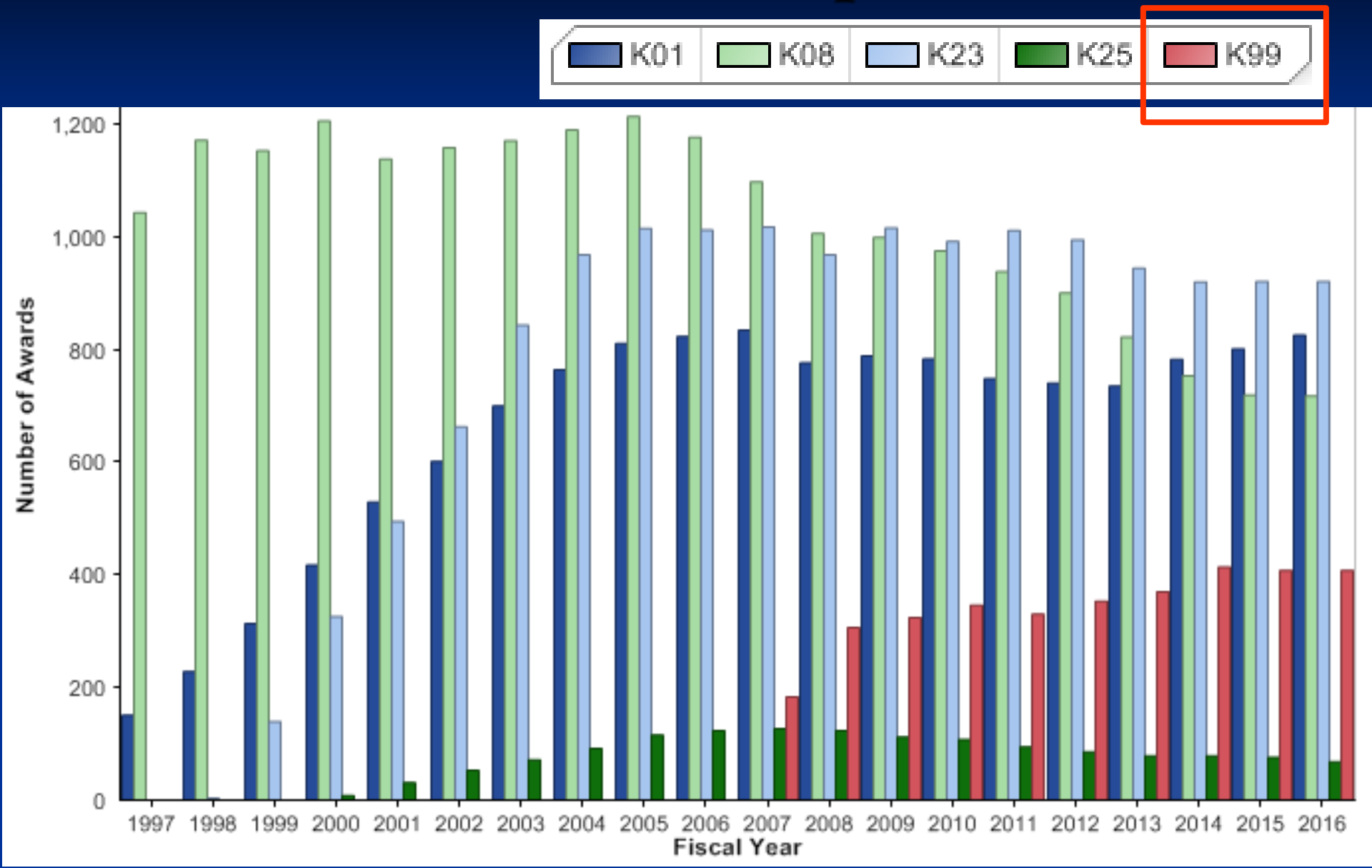


Pathway to Independence Award

- 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
    - Salary and Research Support
  - 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

Research Career Development Awards



National Institutes of Health
Office of Extramural Research

ADVISORY COMMITTEE TO THE DIRECTOR

Physician-Scientist Workforce

5. **NIH should establish a new physician-scientist-specific granting mechanism to facilitate the transition from training to independence.** This program should be similar to the K99/R00 program whose funding currently goes almost exclusively to individuals holding a PhD degree. This new grant program could serve either as a replacement or transition from existing K Awards for physician scientists, and should provide a longer period of support, potentially lengthening the R00 phase to 5 years (with an interim staff review at year 3). This new grant series, as well as K and all other training awards, should rigorously enforce protected time of at least 75 percent effort and provide sufficient salary support to make that possible.

NIH Pathway to Independence Award (Parent K99/R00)

K99/R00 Career Transition Award/Research Transition Award

Funding Opportunity Announcement (FOA) Number PA-16-193

The purpose of the NIH Pathway to Independence Award (K99/R00) program is to increase and maintain a strong cohort of new and talented, NIH-supported, independent investigators. This program is designed to facilitate a timely transition of outstanding postdoctoral researchers with a research and/or clinical doctorate degree from mentored, postdoctoral research positions to independent, tenure-track or equivalent faculty positions. The program will provide independent NIH research support during this transition in order to help awardees to launch competitive, independent research careers.

Prospective candidates are encouraged to contact the relevant NIH staff for IC-specific programmatic and budgetary information: Table of IC-Specific Information, Requirements and Staff Contacts.

http://grants.nih.gov/grants/guide/pa-files/PA-16-193.html

Additional Information for Physician-Scientists

For the purposes of this program, physician-scientists include individuals with an MD, DO, DDS/DMD, DVM/VMD, or nurses with research doctoral degrees who devote the majority of their time to biomedical research. The K99/R00 is intended for those physician-scientists who already have substantial research training and are dedicated to initiating a strong, research-intensive career as physician-scientists. The K99/R00 program is designed to facilitate a timely transition of outstanding physician-scientists from mentored, research positions to independent, tenure-track or equivalent faculty positions, and to provide independent NIH research support during the transition. Individuals who need a longer period of mentored career development before they are prepared to begin the transition to research independence should consider the K08 or K23 program (see: K Kiosk).

http://grants.nih.gov/grants/guide/pa-files/PA-16-193.html

National Institute of Allergy and Infectious Diseases (NIAID)

NIAID Physician-Scientist Pathway to Independence Award (K99/R00)

The purpose of the NIAID Physician-Scientist Pathway to Independence Award (K99/R00) program is to increase and maintain a strong cohort of new and talented independent physician-scientists. This program is designed to facilitate a timely transition of outstanding postdoctoral researchers with a clinical doctorate degree from mentored, postdoctoral research positions to independent, tenure-track or equivalent faculty positions. The program will provide independent NIAID research support during this transition to help awardees launch competitive, independent research careers in biomedical fields and thereby help to address the national physician-scientist workforce shortage.

https://grants.nih.gov/grants/guide/pa-files/PAR-17-329.html

Career Transition Awards

- **BWF: Career Awards for Medical Scientists**
  - To support physician-scientists during the last years of a mentored postdoctoral/fellowship position and the beginning years of an independent faculty position.
  - Candidates must hold an M.D., D.O., D.D.S., or D.V.M. degree
  - 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: Years 3-5
      Annual Total: $170,000

Career Transition Awards

- **American Heart Association**

  Fellow-to-Faculty Transition Award

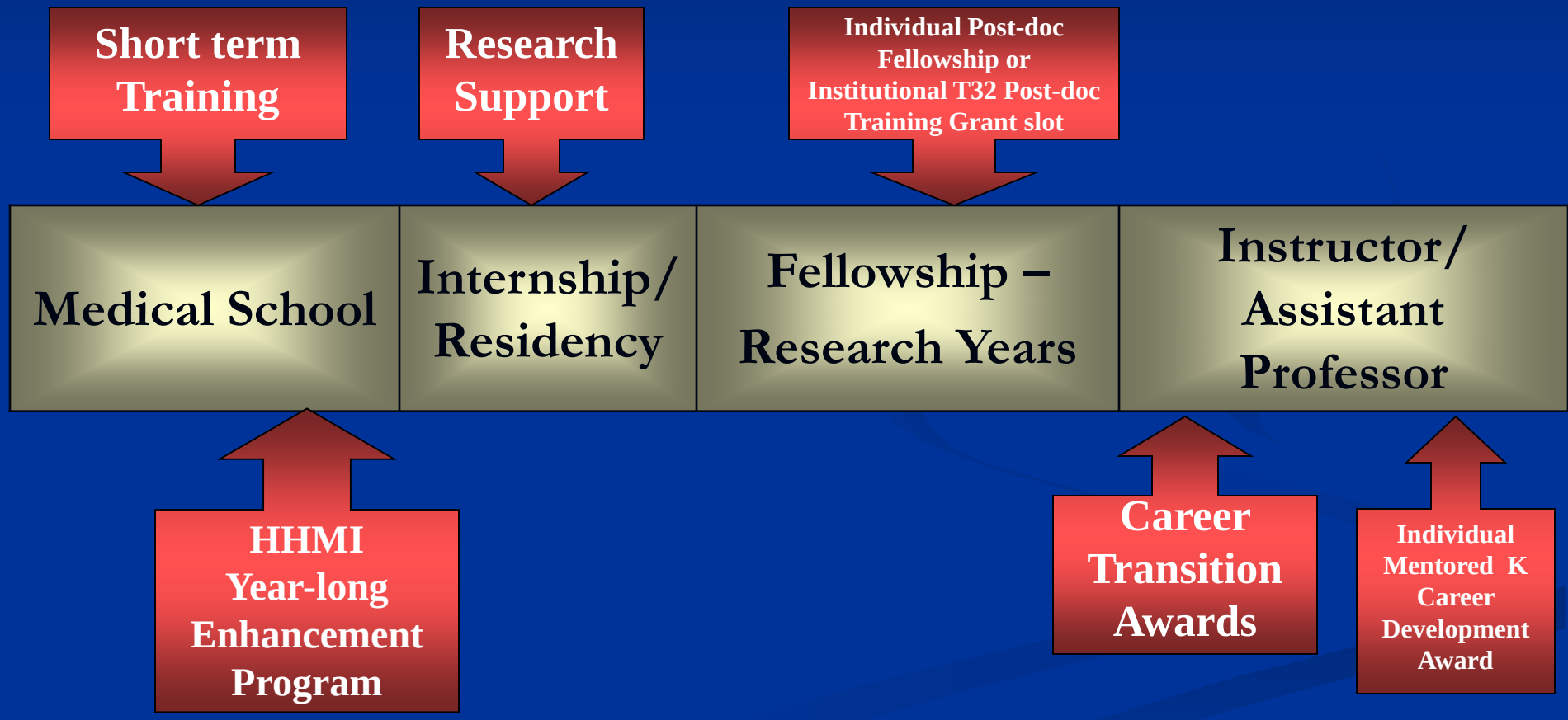
  - Provides funding for the "period of career development that spans the completion of research training through the early years of the first faculty/staff position"
  - Training stage: Maximum of $65,000 per year
  - Faculty stage: Maximum of $132,000 per year
  - Award Duration: 5 years

Career Transition Awards

- **JDRF: Advanced Postdoctoral Fellowships**
  - Supports full-time research training and assist awardees "in transitioning from a fellowship to an independent (faculty-level) position"
  - Generally, the most recent doctoral degree (PhD, MD, DMD, DVM, or equivalent) received no more than 6 years before application
  - No citizenship requirements
  - $95,000 per year for up to 3 years
  - Transition Award: "Optional transition year in which the awardee may request funding support in their first year as a faculty member" (up to $110,000 for one year)

http://grantcenter.jdrf.org/grant-center/information-for-applicants/grant-mechanism-descriptions/advanced-postdoctoral-fellowships/

Timeline of Funding for Junior Investigators



Research Career Programs (K)

- Provides predominantly salary support
- Minimum requirements for the amount of effort that must be devoted to research and career development (e.g. 75%, some exceptions to 50%)
- Up to 5 years
- Specified salary levels
- US citizen/permanent resident.
- Can reduce effort to 50% in last 2 years if PI of NIH research grant

Mentored Clinical Scientist Development Award (K08)

- Support to develop outstanding independent clinician research scientists
- Basic and translational science

Mentored Patient-Oriented Research Career Development Award (K23)

- **Patient-oriented research:** Research conducted with human subjects (or on material of human origin) for which an investigator directly interacts with human subjects

Mentored Research Scientist Development Award (K01)

Not all NIH Institutes participate in program.

Participating Institutes may use for different purposes.

- Train in a new field
- Specific research areas
- Hiatus in research career
- Increase research workforce diversity

Mentored Research Scientist Development Awards (K01)

- NIMH:
  - Supports "broad spectrum of basic and translational research, including basic neuroscience, human genetics, adult and developmental translational research, services and intervention research, and AIDS-related research"
- NINDS:
  - Supports "postdoctoral researchers… Candidates are encouraged to apply for support… between the second through fourth year of cumulative mentored postdoctoral research experience…"
- NCI, NHLBI, NINDS: Promote Faculty Diversity

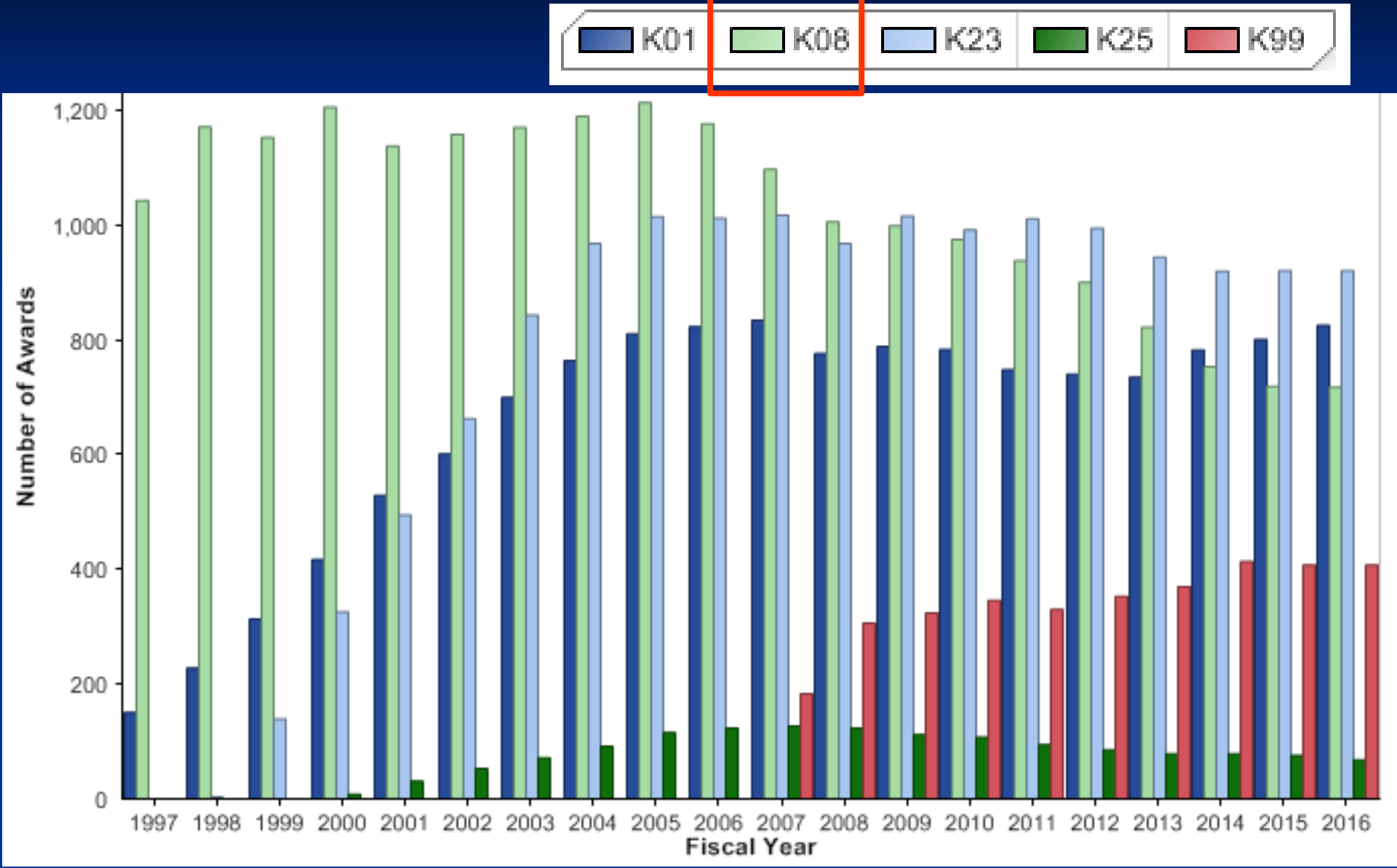
Mentored Research Scientist Development Awards (K01)

- NIAID:
  - (a) Epidemiology
  - (b) Computational Modeling Techniques
  - (c) Outcomes Research
- NLM: Biomedical Informatics and Data Science
- NICHD:
  - (a) Medical Rehabilitation Research
  - (b) Child Abuse and Neglect
  - (c) Population Research
- FIC:
  - International Research Scientist Development Award (IRSDA)

Mentored Research Scientist Development Awards (K01)

- NHGRI:
  - (a) Genomic Sciences
  - (b) Ethical, legal and social issues (ELSI)
- NHLBI:
  - (a) Epidemiology
  - (b) Biostatistics
  - (c) Outcomes Research
  - (d) Implementation Research

Research Career Development Awards



Fiscal Year	Activity Code	NIH Institute / Center	Number of Applications Reviewed	Number of Applications Awarded	Success Rate[2]	Total Funding[3]
2016	K08	NCI	64	20	31.3%	$3,392,677
2016	K08	NHLBI	97	43	44.3%	$7,043,454
2016	K08	NIDCR	12	7	58.3%	$956,539
2016	K08	NIDDK	56	25	44.6%	$3,779,854
2016	K08	NINDS	39	10	25.6%	$1,795,097
2016	K08	NIAID	55	16	29.1%	$2,879,089
2016	K08	NIGMS	7	6	85.7%	$1,122,729
2016	K08	NICHD	22	3	13.6%	$389,578
2016	K08	NEI	20	10	50.0%	$1,989,455
2016	K08	NIEHS	1	0	0.0%	$0
2016	K08	NIA	5	3	60.0%	$533,082
2016	K08	NIAMS	18	11	61.1%	$1,824,472
2016	K08	NIDCD	2	0	0.0%	$0
2016	K08	NIMH	12	5	41.7%	$962,370
2016	K08	NIDA	4	1	25.0%	$153,858
2016	K08	NIAAA	9	1	11.1%	$180,457
2016	K08	NHGRI	3	0	0.0%	$0
2016	K08	NIBIB	3	1	33.3%	$195,723
2016	**K08**	**Activity Total**	**429**	**162**	**37.8%**	**$27,198,434**

NCI K08 Application Success Rate

Fiscal Year	Activity Code	NIH Institute / Center	Number of Applications Reviewed	Number of Applications Awarded	Success Rate[2]	Total Funding[3]
2007	K08	NCI	77	11	14%	$1,497,379
2008	K08	NCI	66	21	32%	$2,857,239
2009	K08	NCI	58	15	26%	$2,398,346
2010	K08	NCI	71	22	31%	$3,610,750
2011	K08	NCI	77	29	38%	$4,699,737
2012	K08	NCI	54	22	41%	$3,464,862
2013	K08	NCI	65	16	25%	$2,667,850
2014	K08	NCI	67	18	27%	$2,971,884
2015	K08	NCI	72	18	25.0%	$3,067,832
2016	K08	NCI	64	20	31.3%	$3,392,677

NIH Research Portfolio Online Reporting Tools (RePORT)

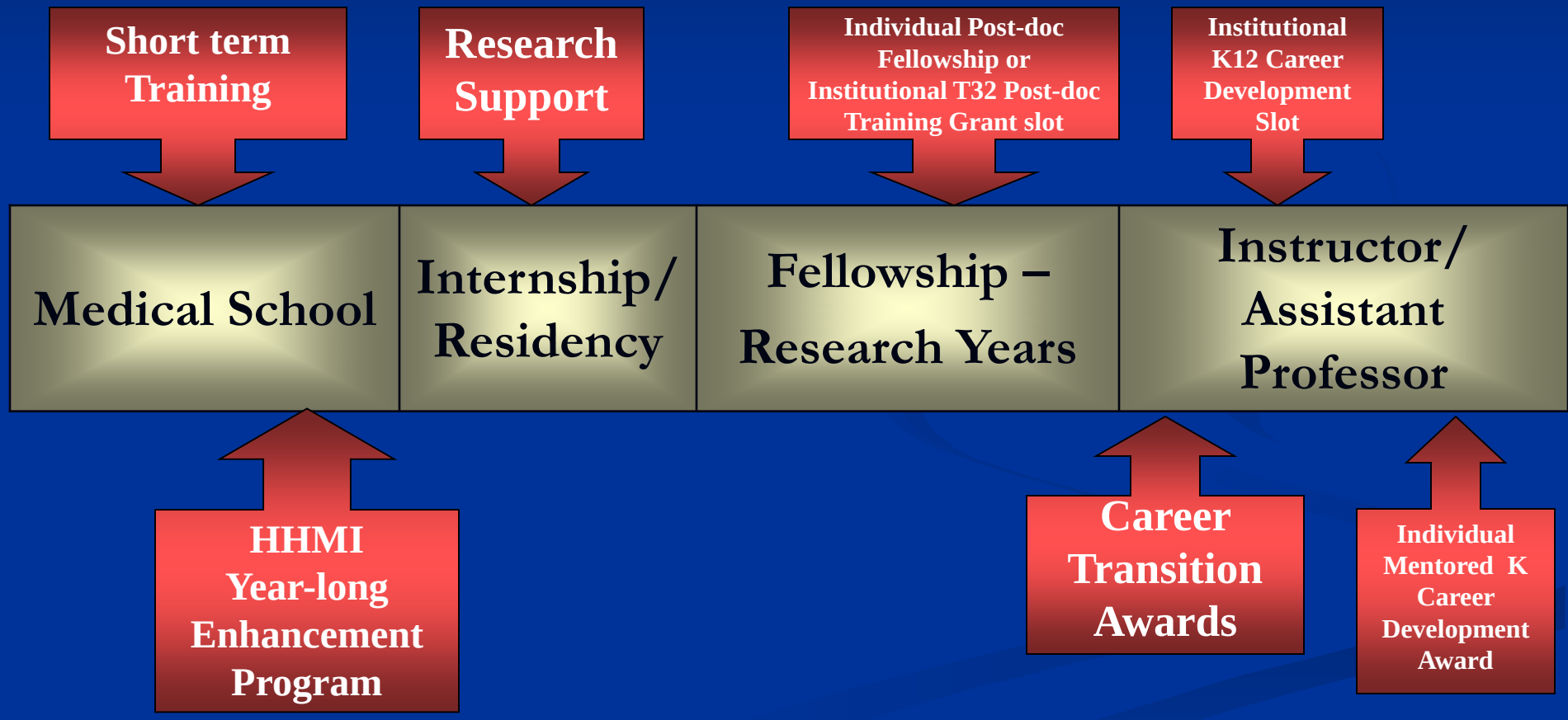
Success Rates

https://report.nih.gov/success_rates/index.aspx

Research Career Development/ Scholar Programs

- AGA Research Foundation
  - Research Scholar Awards
- American Heart Association
  - Career Development Award
- Robert Wood Johnson Foundation
  - Harold Amos Medical Faculty Development Program
- Damon Runyon Cancer Research Foundation
  - Damon Runyon-Rachleff Innovation Award

Timeline of Funding for Junior Investigators



Mentored Clinical Scientist Development Program Award (K12)

- Support to an institution for career development experiences for junior investigators leading to research independence
- Institutions recruit and select candidates into their programs
- Candidates must meet the same criteria as for the individual mentored clinical scientist development award

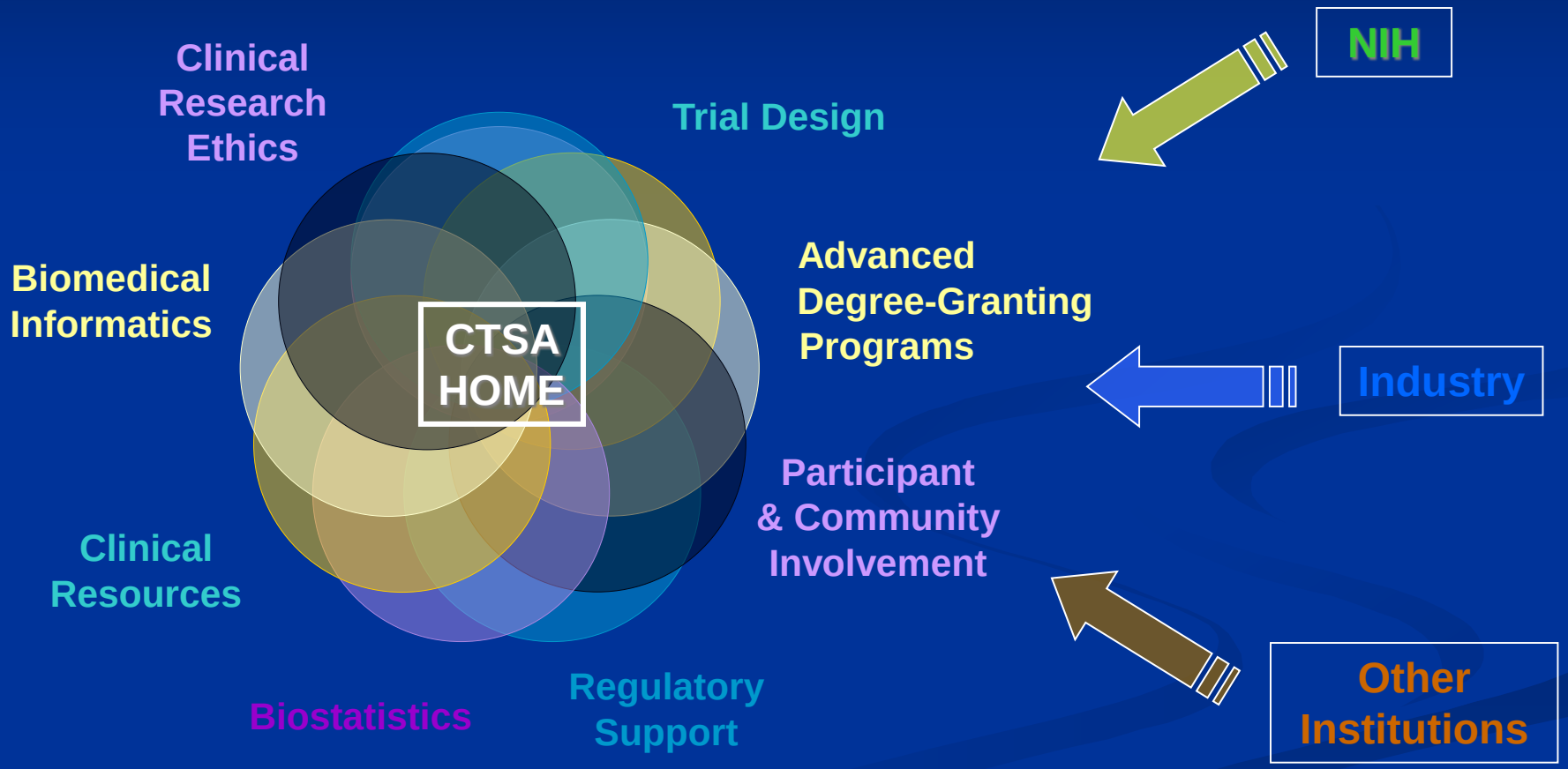
Mentored Clinical Scientist Development Program Award (K12)

- Multi-Institute:
  - Women's Health, Emergency Care
- Institute specific
  - NCI: Clinical oncology
  - NEI: Vision scientists
  - NIDDK: Pediatric diabetes research
  - NICHD:
    - Child health, Pediatric scientists, Reproductive scientists

Mentored Clinical Scientist Development Program Award (K12)

- Institute specific
  - NHLBI:
    - Late stage (T4) translation research, HIV-related
  - NIDA: Drug abuse and addiction
  - NINDS
    - Child Neurologists, Neurosurgeons
- CTSA - Clinical and Translational Scientist Award: KL2

NIH CTSA Awards:
A Home for Clinical and Translational Science



Source: Zerhouni (NIH) [9/06]

David Geffen School of Medicine

Specialty Training and Advanced Research (STAR): "Unique curriculum designed for optimal training of physician-scientists… this program offers the opportunity to combine clinical fellowship or residency training with formal, advanced research training leading to a graduate degree, coordinated with clinical training.." 4 Tracks: Track 1. Physician-Scientist - Basic Science, Track 2. Physician-Scientist - Health Services/Outcomes Research; Track 3. Clinician-Investigator - Clinical Research; Track 4. Physician-Scientist - Postdoctoral Research http://medschool.ucla.edu/star-career-tracks

Stanford MEDICINE

Advanced Residency Training at Stanford (ARTS): "Opportunity to combine clinical training with advanced research training to complete a PhD degree during or upon completion of residency or clinical fellowship. The program begins with one or more years of postgraduate clinical training, followed by research training in a graduate program" http://med.stanford.edu/arts.html

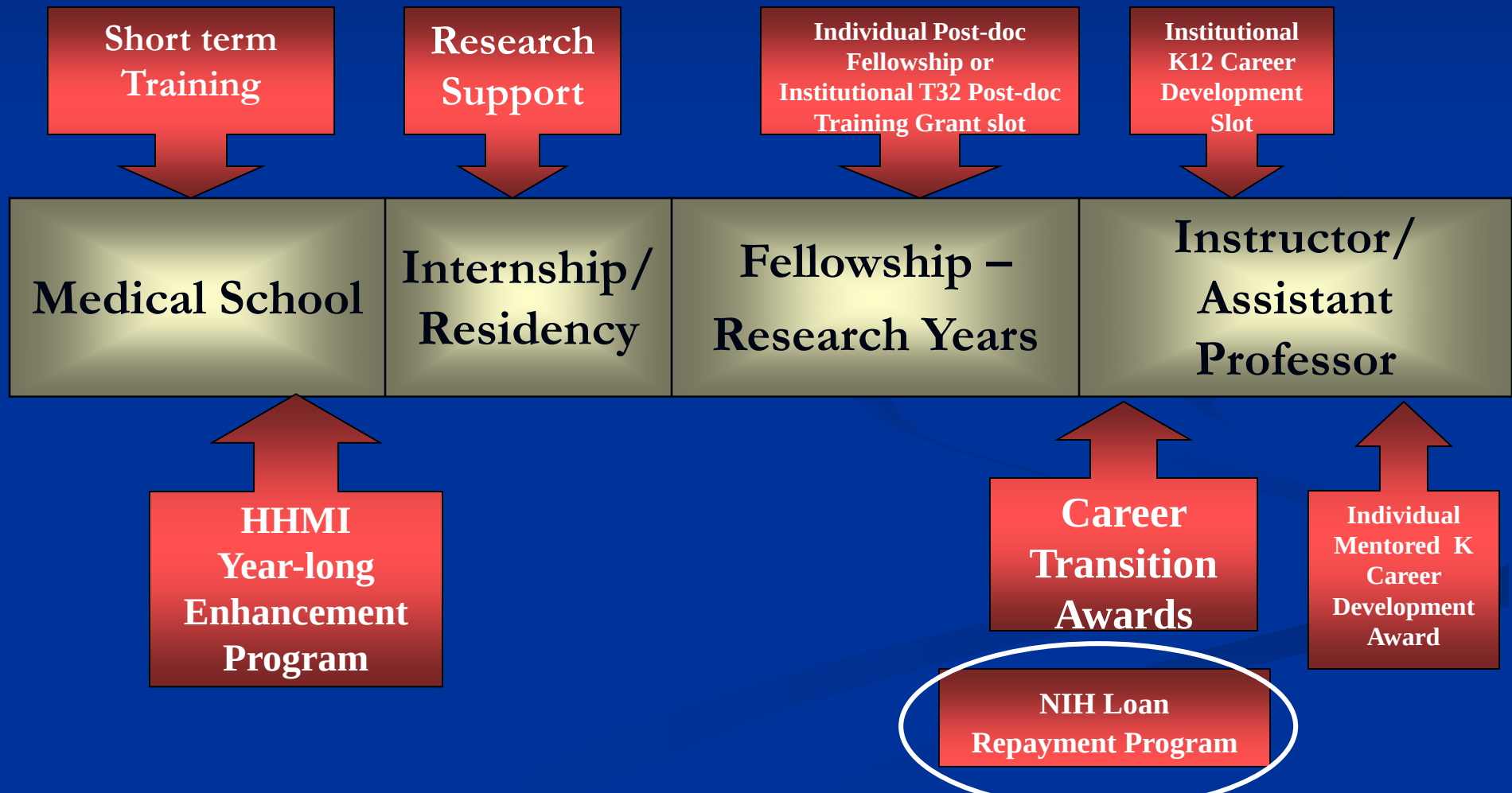
THE AMERICAN SOCIETY FOR CLINICAL INVESTIGATION

Young Physician-Scientist Awards

"The ASCI Council Young Physician-Scientist Awards, initiated in 2013, recognize young physician-scientists who are supported by NIH K or similar significant career-development awards, are early in their first faculty appointment, and have made notable achievements in their research."

https://www.the-asci.org/ypsa/awards

Timeline of Funding for Junior Investigators



NIH's Extramural Loan Repayment Program

http://www.lrp.nih.gov/

- Up to $35,000/year towards educational loan debt
- Conduct qualified research activities for at least 50% of professional effort (or 20 hours per week) for 2 years
- Qualifying educational loan debt equals or exceeds 20% of the applicant's institutional base salary

NIH's Extramural Loan Repayment Program

- May competitively apply for one-year renewal
- Repayments represent taxable income and are paid in addition to loan

Eligibility:

- U.S. citizen/Permanent residence
- Recipient of M.D., Ph.D., D.D.S. D.M.D., or other specified equivalent doctoral degree

NIH's Extramural Loan Repayment Program

Extramural Programs

- Clinical Research
- Pediatric Research
- Health Disparities Research
- Clinical Researchers from Disadvantaged Backgrounds
- Contraception and Infertility Research

National Institutes of Health
Division of Loan Repayment

LRP Dashboard

National Institutes of Health
Office of Extramural Research

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Physician-Scientist Workforce

6. **NIH should expand Loan Repayment Programs and the amount of loans forgiven should be increased to more realistically reflect the debt burden of current trainees.** This program should also be made available to all students pursuing biomedical physician-scientist researcher careers, regardless of particular research area or clinical specialty.

Health Resources and Services Administration
Loan Repayment Programs

Faculty Loan Repayment Program

- "Pursuing a career as a faculty member at a health professions school…
- Loan payment assistance up to $40,000…
- From a disadvantaged background, based on environmental and/or economic factors"

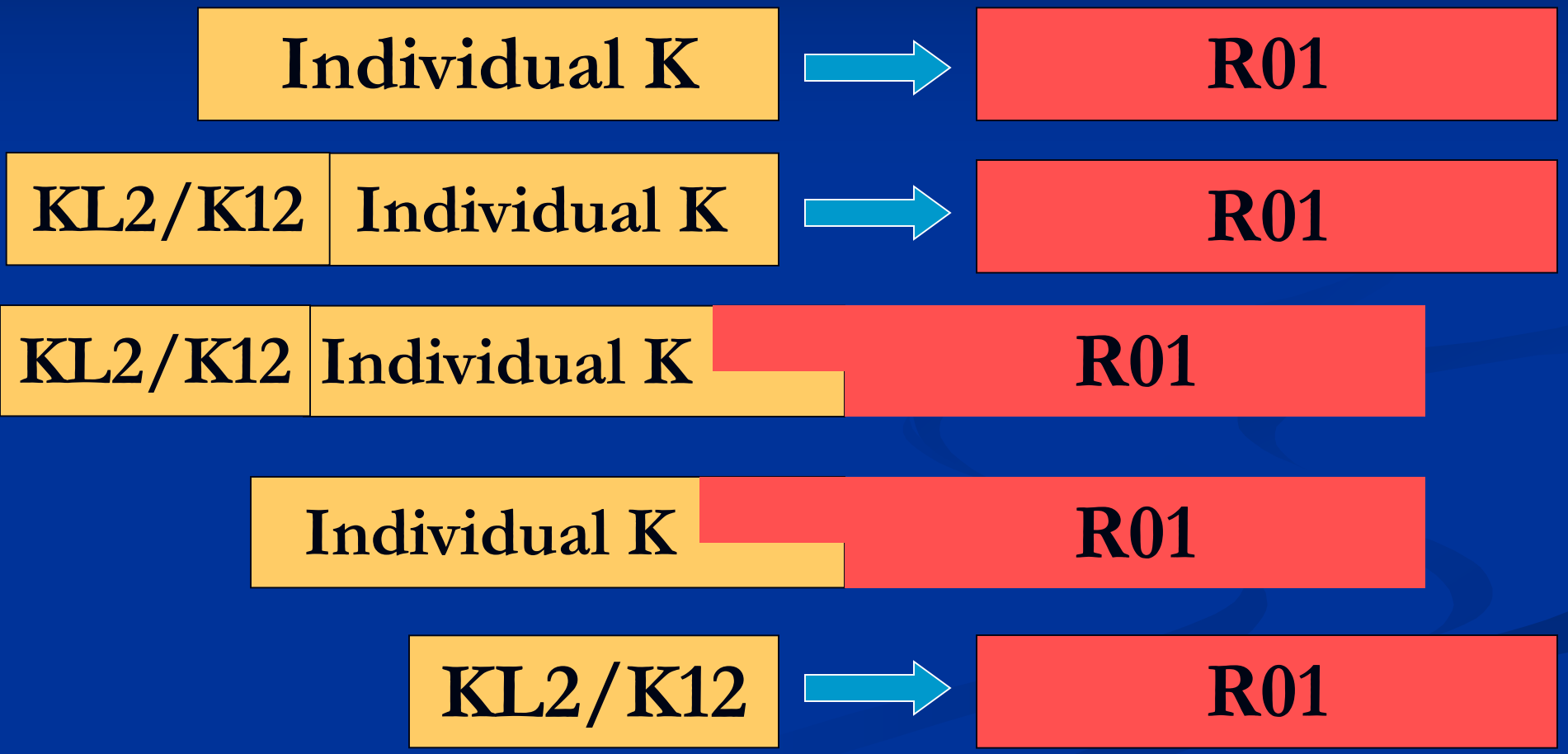
https://bhw.hrsa.gov/loansscholarships/flrp

National Health Service Corps (NHSC)

- "Primary care medical, dental and mental/behavioral health clinicians…
- Up to $50,000 to repay their health profession student loans…
- Two-year commitment to work at an approved NHSC site in a high-need, underserved area"

https://nhsc.hrsa.gov/loanrepayment/loanrepaymentprogram.html

Career Development (K) Support to Research Grant (R01)



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)

nature

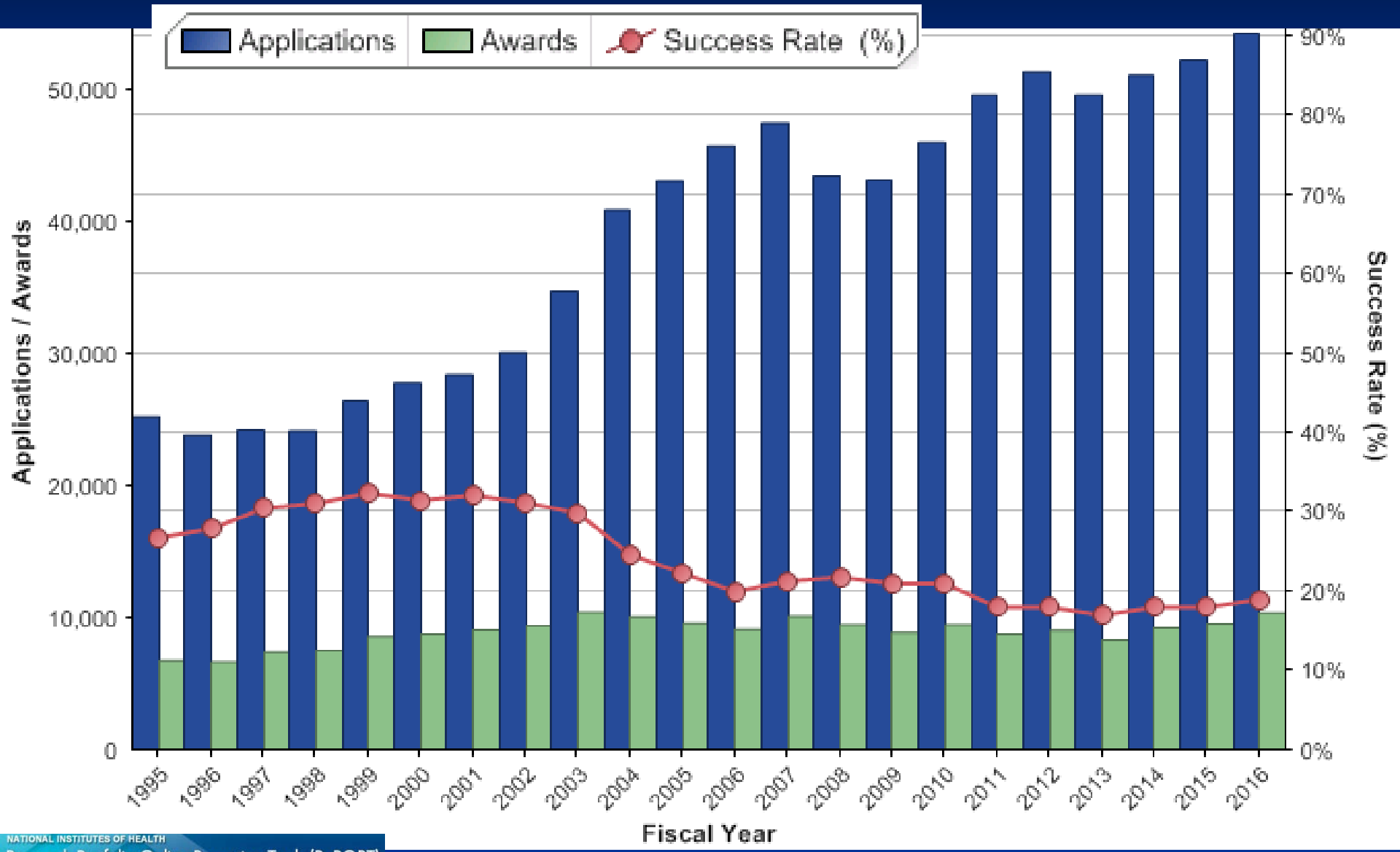
Research Grant (NIH R01)

- Supports a discrete, specified project
  - Specific Aims
- "Comprehensive" funding
- Modular budgets up to $250,000/year
- Multi-year
- Flexibility
- Most NIH-supported investigator-initiated research is through this funding mechanism

Research Grant (NIH R01)

- Funds research project
  - Salaries of PI and other research personnel
  - Supplies, reagents, etc
  - Animal costs
  - Patient care costs
  - Core facilities
  - Travel to national meetings
- Multi-Year (4yrs – 5yrs)
- Renewable
  - e.g. original grant + 2 renewals = 15yrs

Research Project Grants: Applications, Awards, and Success Rates



Challenging Times for All Researchers

	1999	2007
Overall success rate for NIH RO1* Proposals	32%	24%
Success rate on first submission	29%	12%

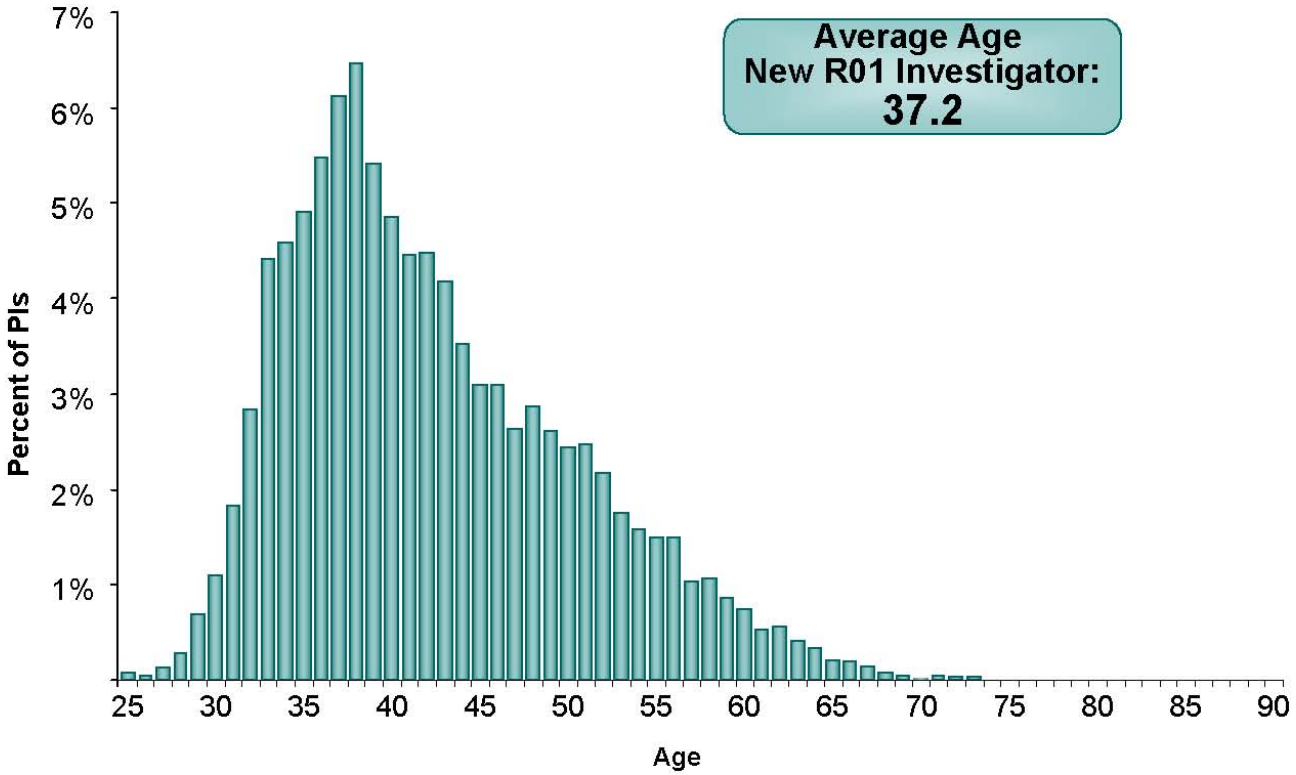
Especially for Young Investigators

	Then 1990	Now 2007
Age at first Ro1* grant	39	43
% of Ro1s* that go to first-time investigators	29%	25%

**RO1 Equivalents: RO1, R29, R37*
Source: National Institutes of Health

http://www.brokenpipeline.org/brokenpipeline.pdf

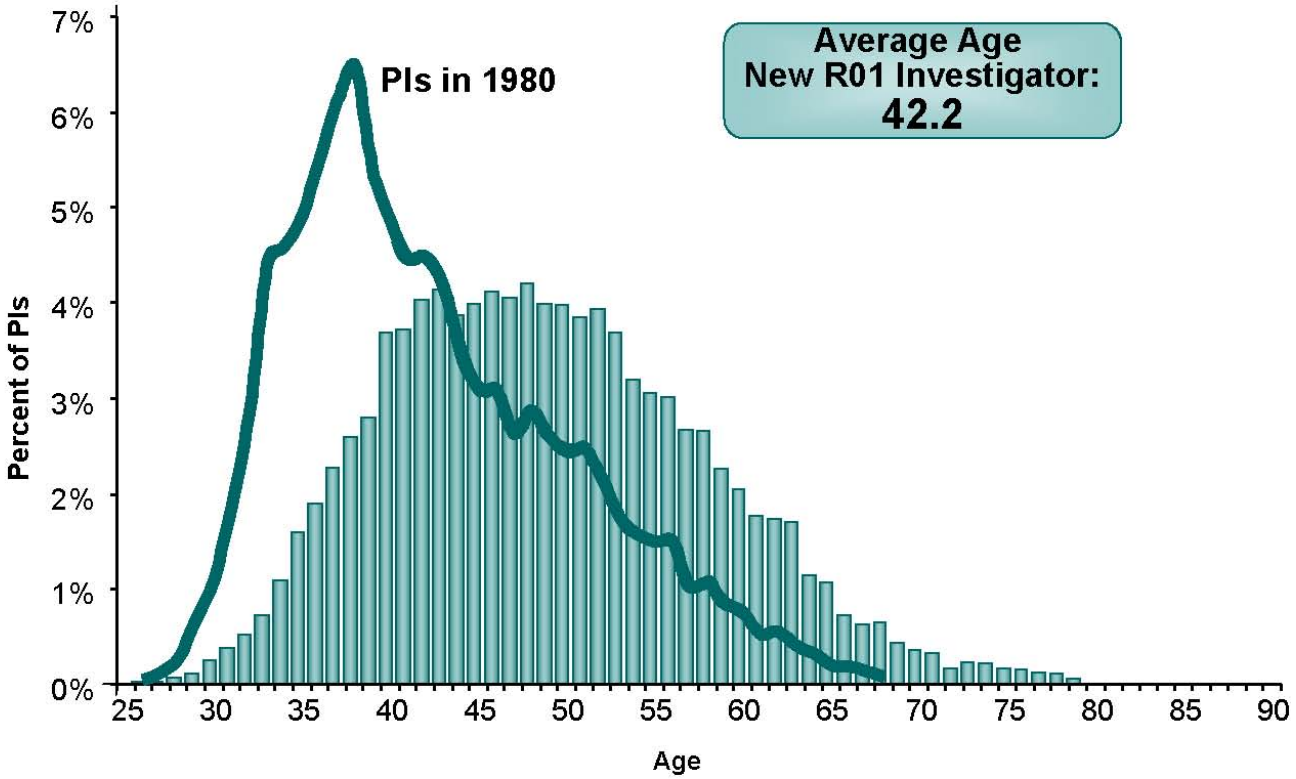
Age Distribution of NIH RPG Investigators: 1980



Sources: IMPAC II Current and History Files

http://enhancing-peer-review.nih.gov/meetings/Peer%20Review%20Implementation%20FINAL%20DRAFT%20update%20-

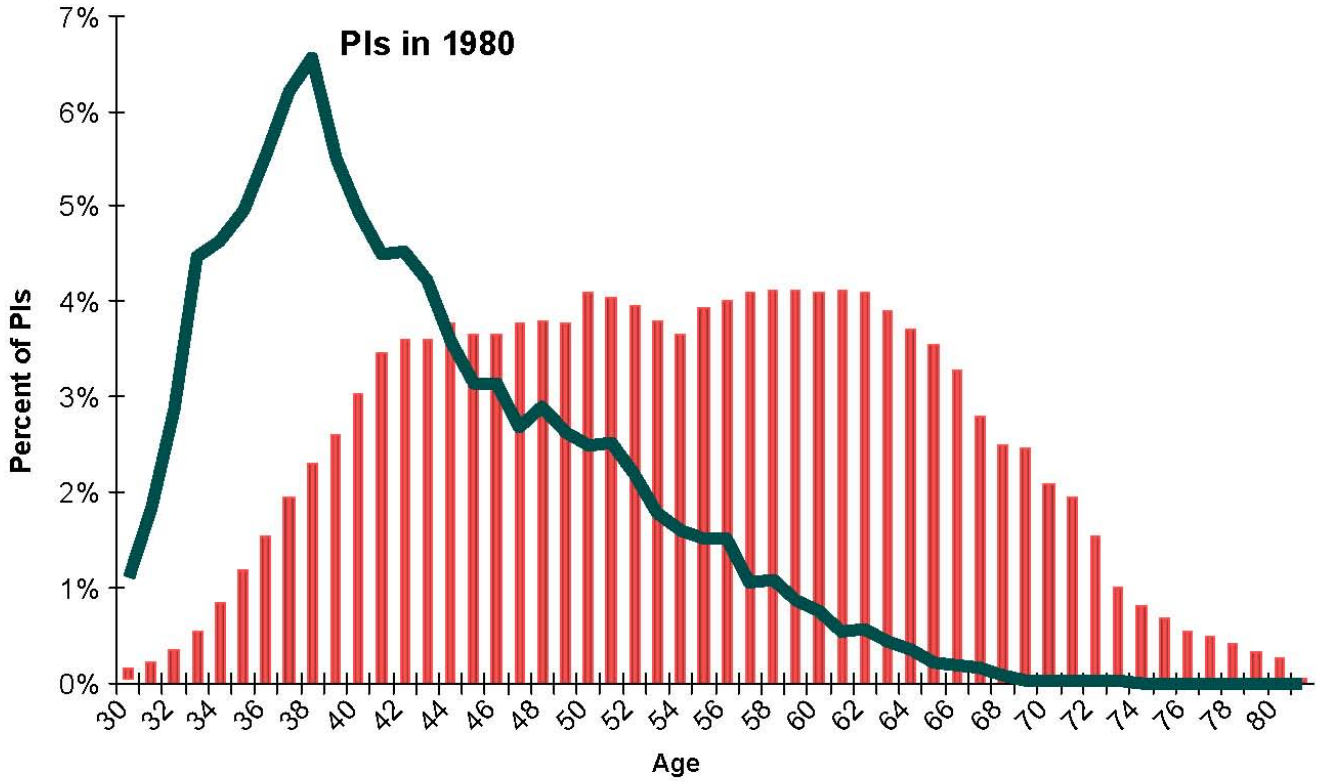
Age Distribution of NIH RPG Investigators: 2006



Sources: IMPAC II Current and History Files

http://enhancing-peer-review.nih.gov/meetings/Peer%20Review%20Implementation%20FINAL%20DRAFT%20update%20-

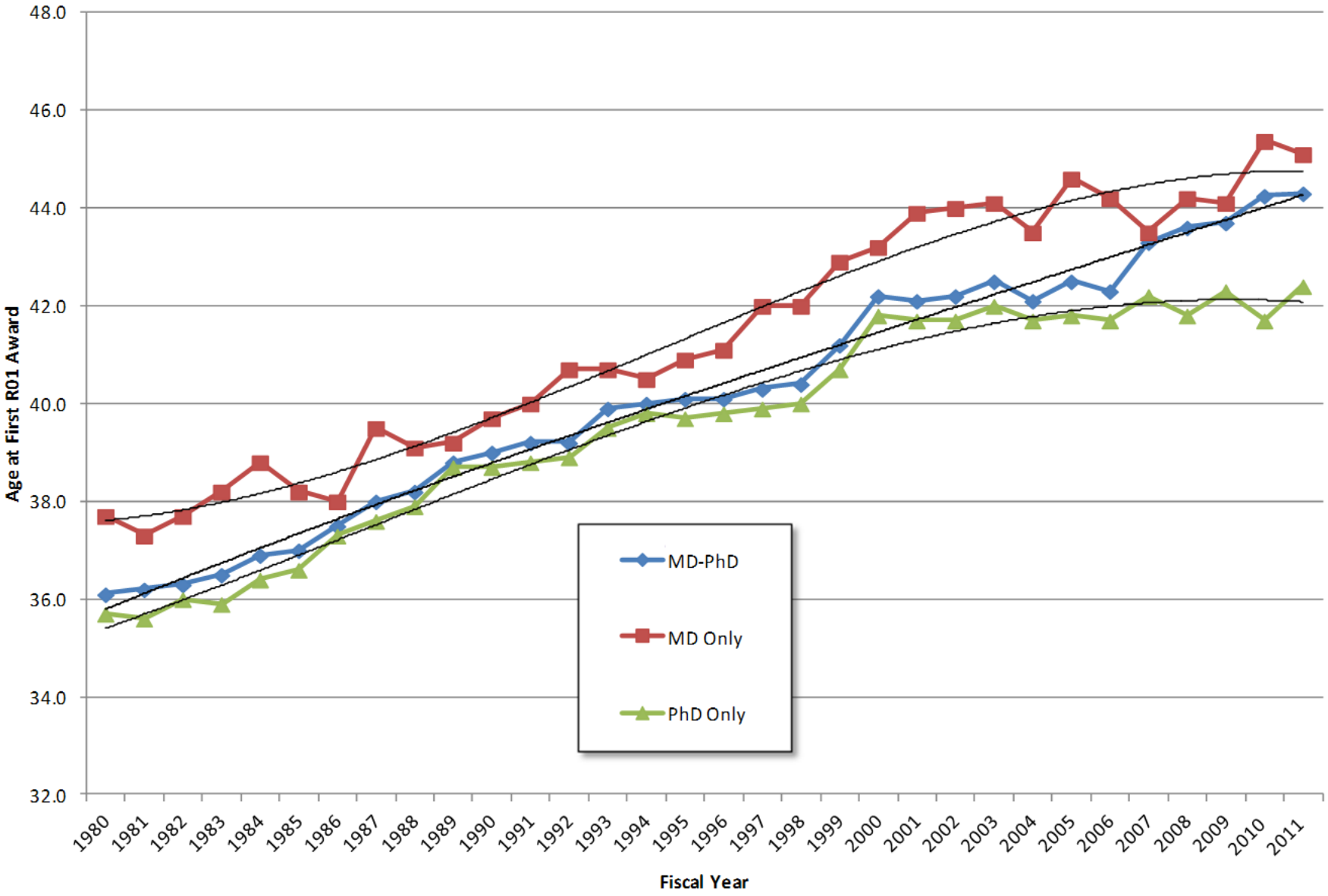
Preliminary Projection of Age Distribution of NIH RPG Investigators: 2020



Sources: IMPAC II Current and History Files and Preliminary Demographic Projection Model

http://enhancing-peer-review.nih.gov/meetings/Peer%20Review%20Implementation%20FINAL%20DRAFT%20update%20-

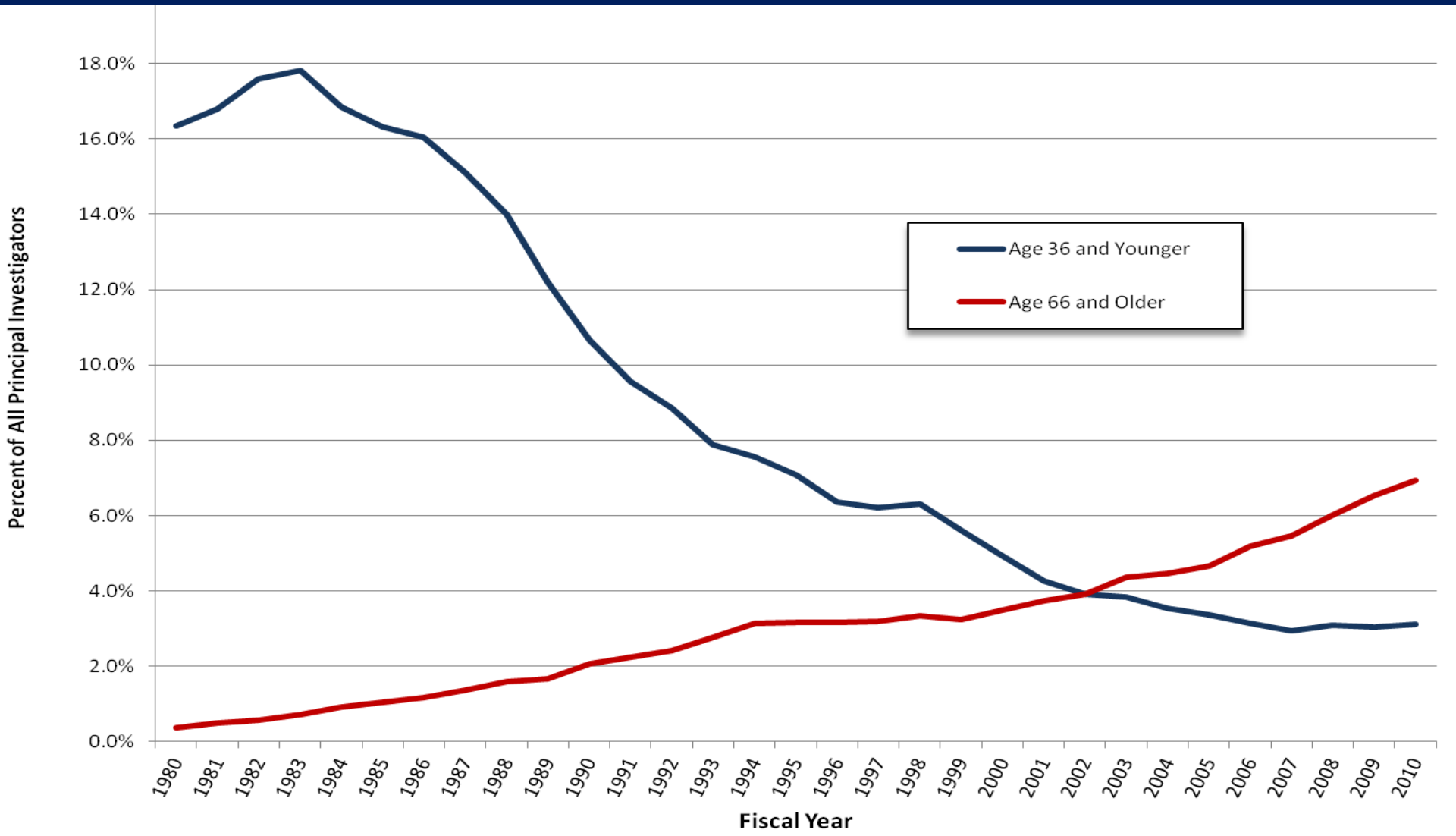
Figure 1. Average Age of Principal Investigators with MD, MD-PhD, or PhD at the time of First R01 Equivalent Award from NIH, Fiscal Years 1980 to 2011



"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)]

http://nexus.od.nih.gov/all/2012/02/03/our-commitment-to-supporting-the-next-generation

NIH R01 Principal Investigators: Age 36 and Younger / Age 66 and Older



The Opinion Pages

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

Ping Zhu

http://www.nytimes.com/2014/10/03/opinion/young-brilliant-and-underfunded.html?ref=opinion

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.

http://www.nytimes.com/2014/10/03/opinion/young-brilliant-and-underfunded.html?ref=opinion

Young scientists lead the way on fresh ideas

Analysis of millions of papers finds that junior biomedical researchers tend to work on more innovative topics than their senior colleagues do.

Young researchers are much more likely than older scientists to study exciting innovative topics, according to a text analysis of more than 20 million biomedical papers published over the past 70 years. More-senior researchers are more likely to publish in hot areas when they are supervising a younger scientist.

Young scientists go for fresh ideas.
Callaway E.
Nature. 2015 Feb 19;518(7539):283-4. doi: 10.1038/518283a.

Age and the Trying Out of New Ideas

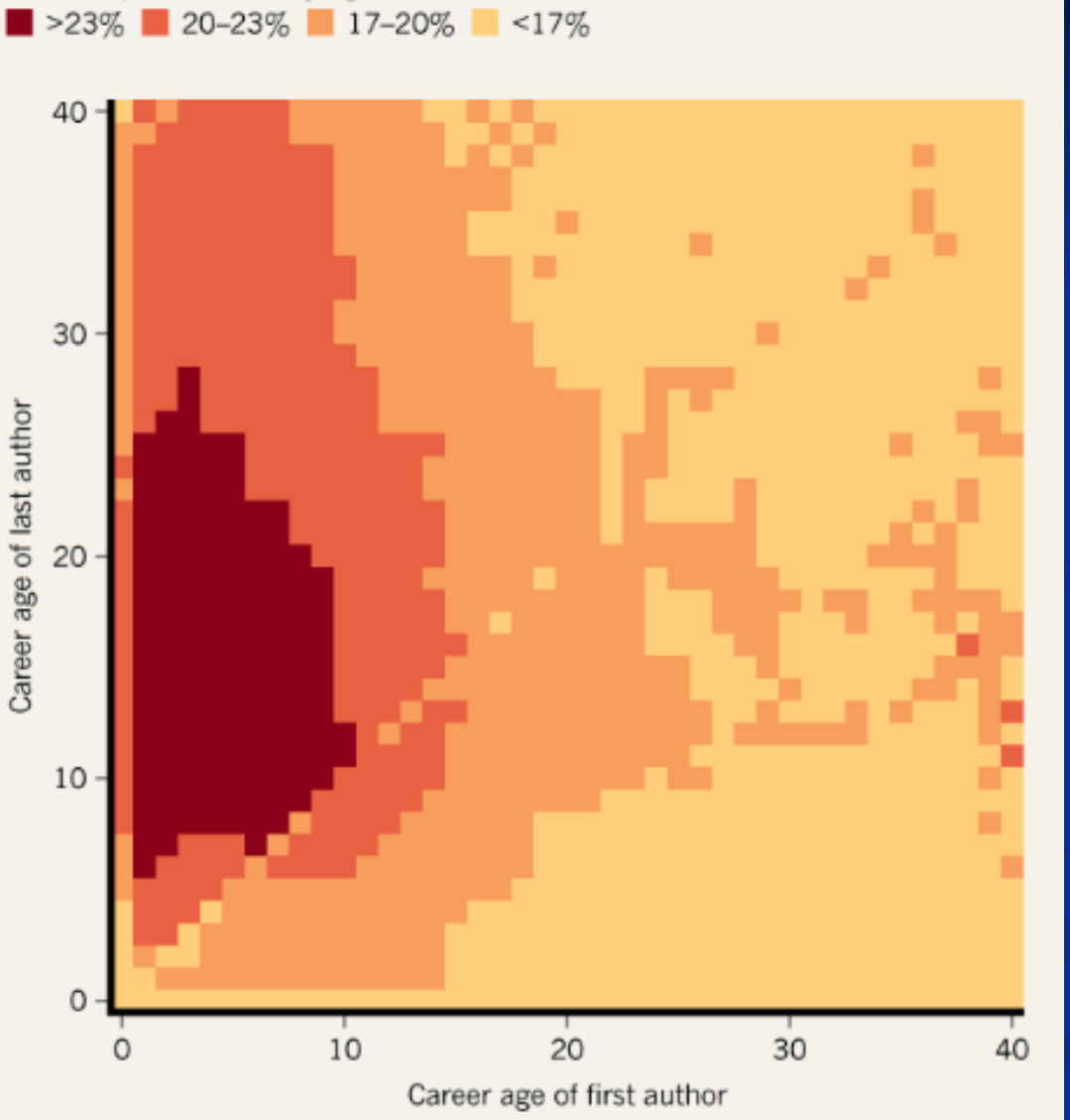
Mikko Packalen, Jay Bhattacharya

NBER Working Paper No. 20920

http://www.nature.com/news/young-scientists-lead-the-way-on-fresh-ideas-1.16934
http://www.nber.org/papers/w20920

HOT SPOT

Pairings of young first authors and mid-career last authors are the most likely to work on the hottest biomedical topics.

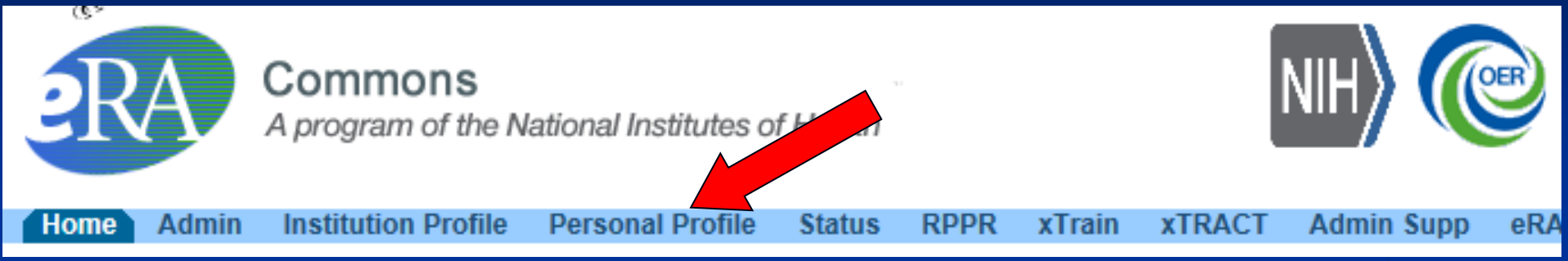


Source: M. Packalen & J. Bhattacharya Preprint at http://doi.org/z87 (2015)

Early Stage Investigator (ESI)

- Has not 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 Investigator (ESI)



Early Stage Investigator (ESI) Status

ESI status gives you special consideration and enhanced benefits when applying for certain grants. Young investigators have this status for 10 years after they receive a PhD.

See more Information on ESI

Your Status **Not eligible:** No completed terminal degree has been indicated.

https://public.era.nih.gov/commons/jsp/index.jsp

Early Stage Investigator (ESI)

- New and Early Stage Investigator Policies

https://grants.nih.gov/policy/new_investigators/index.htm

- Frequently Asked Questions

https://grants.nih.gov/grants/new_investigators/investigator_policies_faqs.htm

- Extension to the Early Stage Investigator Period

Form for Requesting an Extension in the Early Stage Investigator (ESI) Period.

ESI extensions will be considered only after the terminal research degree and/or the residency end date has been added to the eRA Commons Profile

Sample requests for extension of the ESI period

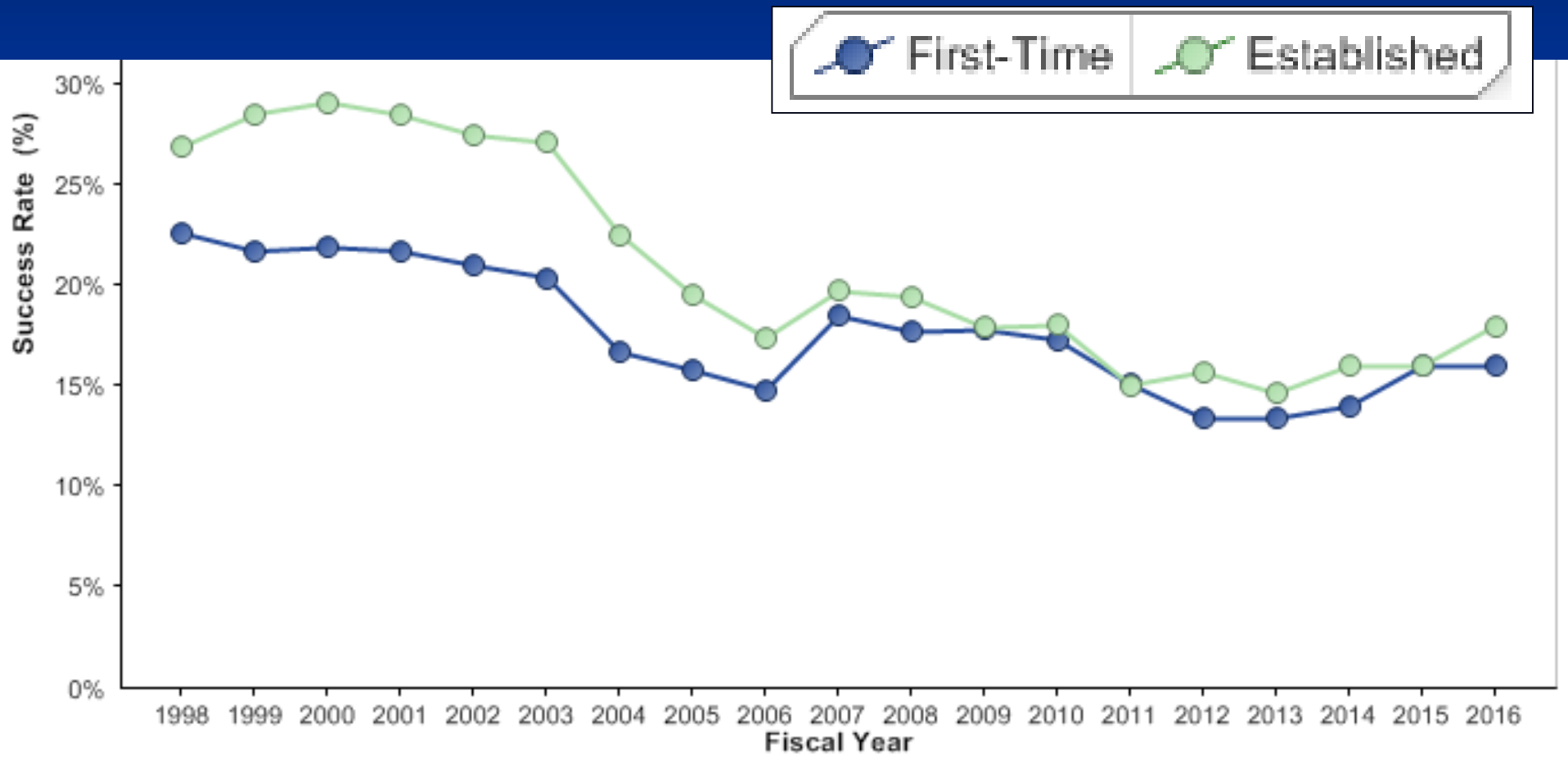
Early Stage Investigators: NHLBI

Payline		
Grant Program	**Grant Program Description**	**Percentile**
R01	Research Project Grant	15
R01 ESI	Early Stage Investigators	25

FY17

http://www.nhlbi.nih.gov/research/funding/general/current-operating-guidelines

R01-Equivalent grants, New (Type 1): Success rates, by career stage of investigator



Next Generation Researchers Initiative

The 21st Century Cures Act, enacted December 13, 2016, includes a section entitled, "Investing in the Next Generation of Researchers" that requires the Director to "Develop, modify, or prioritize policies, as needed, within the National Institutes of Health to promote opportunities for new researchers and earlier research independence, such as policies to increase opportunities for new researchers to receive funding, enhance training and mentorship programs for researchers, and enhance workforce diversity". To ensure the long term stability of the biomedical research enterprise, NIH must encourage successful independent careers for Early Stage Investigators (ESIs), and retain them as they become Early Established Investigators (EEIs) in a way that enhances workforce diversity.

https://grants.nih.gov/ngri.htm

Policy Supporting the Next Generation Researchers Initiative

Early Stage Investigator (ESI): "Program Director / Principal Investigator (PD/PI) who has completed their terminal research degree or end of post-graduate clinical training, whichever date is later, within the past 10 years and who has not previously competed successfully as PD/PI for a substantial NIH independent research award….
Under the Next Generation Researchers policy, meritorious R01-equivalent applications with ESI PD/PIs will be prioritized for funding."

Early Established Investigator (EEI): "PD/PI who is within 10 years of receiving their first substantial, independent competing NIH R01-equivalent research award as an ESI. A meritorious application with a designated PD/PI EEI may be prioritized for funding if:

1. The EEI lost or is at risk for losing all NIH research support if not funded by competing awards this year, OR
2. The EEI is supported by only one active award."

https://grants.nih.gov/grants/guide/notice-files/NOT-OD-17-101.html

National Institutes of Health
Turning Discovery Into Health

ADVISORY COMMITTEE TO THE DIRECTOR

Next Generation Researchers Initiative Working Group

ACD Physician-Scientist Workforce

ACD Working Group on Diversity

ACD Working Group on Biomedical Workforce

https://acd.od.nih.gov/

Topics to be Discussed

- **Funding Agencies**
  - Federal
    - National Institutes of Health
  - Voluntary Health Organizations, Professional Societies, Foundations, Industry, Other
- **Types of Awards**
  - Fellowships (F's), Training grants (T's), Career Transition Awards, Research grants,
- **Planning & Organizing a Research Proposal**

Approaches for Competitive Applications

- Identify Funding
- Prepare to Write the Grant Application
- Complete the Grant Application

Identify Funding

- Identify appropriate funding agencies
  - Government
  - Non-government
- Identify appropriate funding mechanisms
  - Research
  - Training
- Create a calendar of application deadlines for identified funding programs

How to Find Funding Opportunities

- Networking
- Speak to colleagues who are in a similar field
- Speak to colleagues who have been on governmental or private agency review panels
- Speak to colleagues who are on (advisory) boards of private agencies
- Acknowledgement section of publications, oral/poster presentations, press releases, etc.

General Resources

- Grants.gov
  - Database and application system for Federal grants
  - http://www.Grants.gov/
- FedBizOpps (Federal Business Opportunities)
  - Single point-of-entry for Federal contracts
  - http://www.FedBizOpps.gov/
- Foundation Center
  - http://foundationcenter.org/

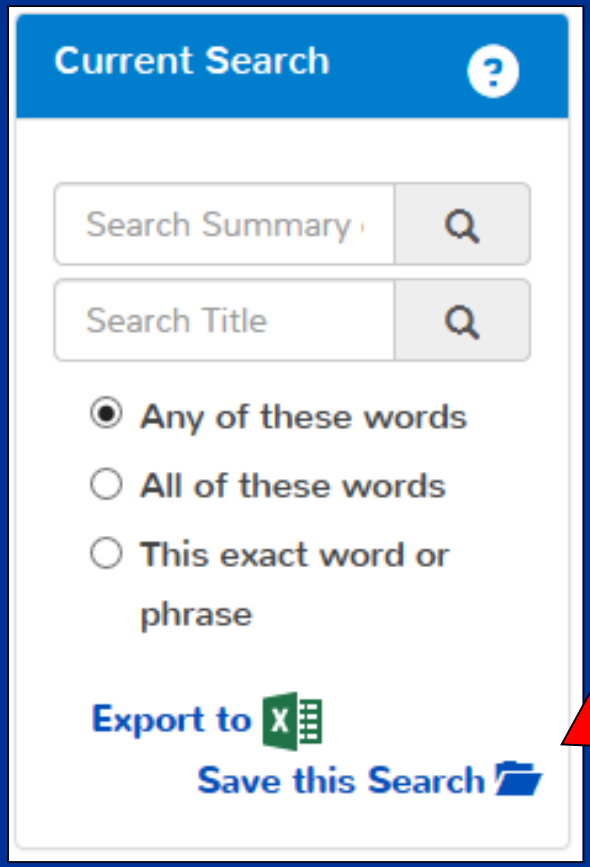
Other Sources of Information

- Sponsor publications/website/social media which describe research/programmatic interests (e.g. newsletters, strategic plans, annual reports)
- Sponsor e-mail alert modules
  - NIH
    - *NIH Guide*: http://grants.nih.gov/searchGuide/search_guide.cfm
      - Able to save queries and have "ongoing" results e-mailed as funding alerts

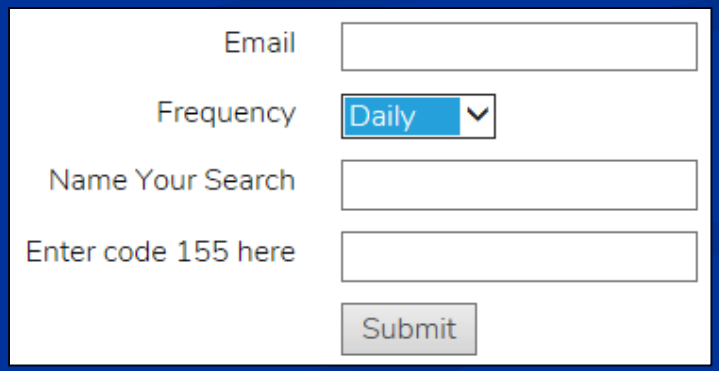
NIH Guide to Grants and Contracts

Current Weekly Table of Contents (TOC)

Weekly Update via E-mail LISTSERV - Subscribe or Unsubscribe.



Save Your Search



https://grants.nih.gov/funding/searchGuide/nih-guide-to-grants-and-contracts.cfm

Approaches for Competitive Applications

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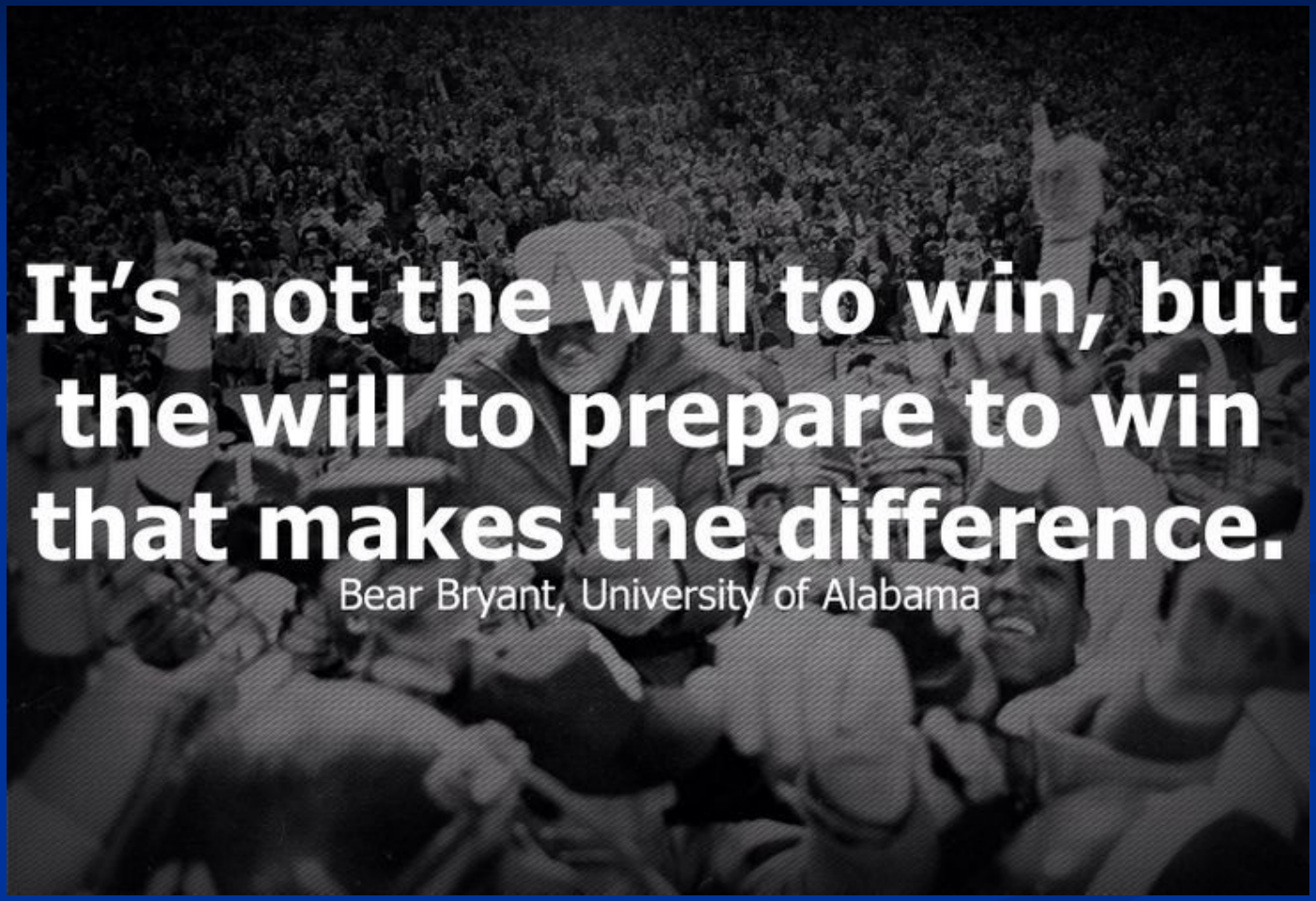

https://s-media-cache-ak0.pinimg.com/736x/62/93/92/629392429de6a72b8da10f410b569869.jpg

Prepare to Complete the Grant Application

- Speak with Agency Program Officer
- Speak with colleagues who are/were awardees
- Review funded applications if possible
- Review agency's review criteria
- Identify what will make the application more competitive
  - Research and/or career development arrangements
  - Access to core facilities/research resources
- Strengthen "Preliminary Work/ Pilot Data"
- Who will write confidential letters of reference?

Research and Career Development Arrangements

- Multiple Principle Investigators (research awards)
- Multiple Mentors (mentored awards)
- Advisors (mentored awards)
- Co-investigators/Collaborations
- Subcontracts to other institutions
- Multidisciplinary/Interdisciplinary

Prepare to Complete the Grant Application

- Identify and meet with Co-investigators, Collaborators, Consultants, Advisors
  - Identify roles and responsibilities
  - Administrative requirements (e.g. if other countries/institutions are involved)
- Identify necessary core facilities and other research resources
- Meet with research administrators
- Human subjects, lab animals and any other regulatory issues?

Approaches for Competitive Applications

- Identify Funding
- Prepare to Write the Grant Application
- Complete the Grant Application

Complete the Grant Application

- Review the application instructions
- Identify the different components
- Create a checklist
- Create an outline
  - Content, Length of section (*vis a vis* page limits)
- Identify and delegate responsibilities for the different components
  - Technical/Scientific
  - Administrative – e.g. budget
  - Regulatory
  - Draft letters of collaboration/support

Complete the Grant Application

- Confirm page limits for each component
- Create a schedule for any required meetings
- Determine:
  - Shared computer drive/folders
  - Naming of files (dates?)
  - Track changes?
  - Font, margin, format of literature citation
- Set a firm time-line for each responsibility
  - Writing milestones
  - Absolute deadline date for final compilation

Complete the Grant 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 ("the hypothesis of my study is…")
- Discuss limitations and potential "challenges" and how these will be addressed (e.g., "alternate approaches")
- Include well-designed tables and figures
- Present an organized, lucid write-up (use an outline)
- Ask colleagues to review and comment

Complete the Grant Application

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- **Include well-designed tables and figures**
- Present an organized, lucid write-up (use an outline)
- Ask colleagues to review and comment

Include Well-Designed Tables and Figures

- Include explanatory caption with the figure (not buried in text)
- Not overly complicated
- Informative, even if printed in black and white
- Easy for the reviewers to read
- Tips:
  - Bold label in text (e.g., **Fig. 4**) so it's easier for reviewers to locate relevant text for individual Figure
  - Try to have Figure and relevant text on the same page

Timeline for Specific Aims and Benchmarks/Milestones of Research Progress

Benchmarks/ Milestones	Year 1	Year 2	Year 3
Summary of Specific Aim 1a			
Summary of Specific Aim 1b			
Summary of Specific Aim 2a			
Summary of Specific Aim 2b			
Summary of Specific Aim 3			

Anticipate Questions
and
Answer them before
they are asked

Not everything that can be counted counts.

Not everything that counts can be counted.

Research Plan Section

3. Specific Aims

4. * Research Strategy

Candidate Section

2. Candidate Information and Goals for Career Development

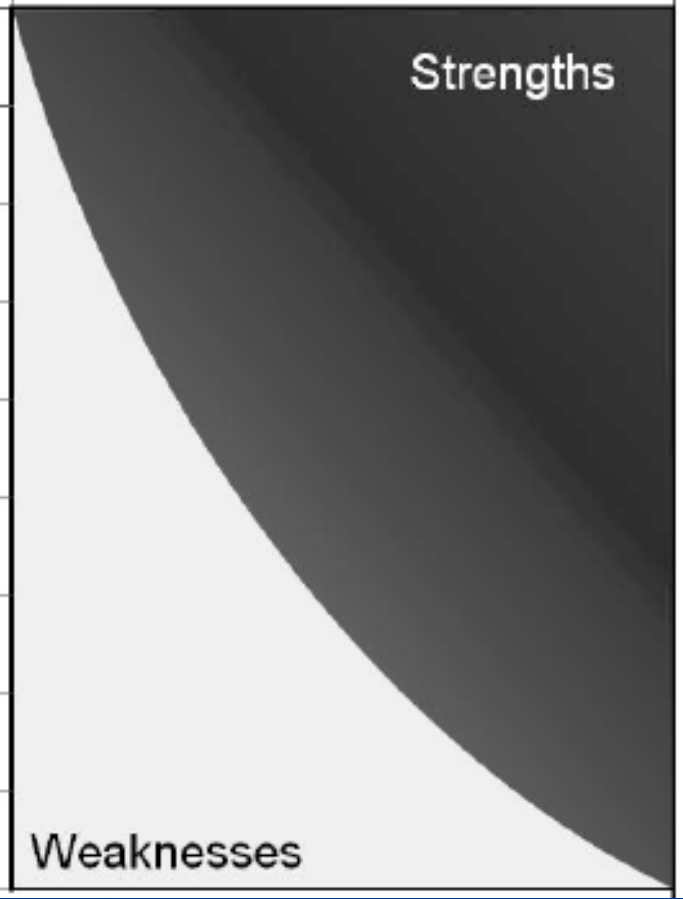
Quote Investigator suggests crediting sociologist William Bruce Cameron
http://quoteinvestigator.com/2010/05/26/everything-counts-einstein/

Investigator

- Competent
- Enthusiastic
- Thorough
- Professional

NIH's Evaluation System

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

Impact	Score	Descriptor	Strengths/Weaknesses
High Impact	1	Exceptional	
	2	Outstanding	
	3	Excellent	
Moderate Impact	4	Very Good	
	5	Good	
	6	Satisfactory	
Low Impact	7	Fair	
	8	Marginal	
	9	Poor	

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

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

http://grants.nih.gov/grants/peer/guidelines_general/scoring_system_and_procedure.pdf

Overall Impact *Write a paragraph summarizing the factors that informed your Overall Impact score.*

Separate Scores for the Individual Criteria

1. Candidate

Strengths

-

Weaknesses

-

2. Career Development Plan/Career Goals & Objectives/Plan to Provide Mentoring

Strengths

-

Weaknesses

-

3. Research Plan

Strengths

-

Weaknesses

-

4. Mentor(s), Co-Mentor(s), Consultant(s), Collaborator(s)
Strengths • **Weaknesses** •

5. Environment and Institutional Commitment to the Candidate
Strengths • **Weaknesses** •

Personal Statement/ Candidate's Background

When describing a previous research experience:

- What was the hypothesis/scientific question?
- Why was the study important?
- What were the findings and conclusions?
- What were your role and responsibilities?
- What did you learn and accomplish?
  - "Intellectual aspects"
  - Do not focus on technical aspects
- Cite any resulting publications
- Describe any honors/awards and conference/workshop presentations

Possible Problems Specific for Mentored Fellowship Awards

Mentor

- Too many other responsibilities (e.g. administrative, clinical)
- Too many other mentees (e.g. students, post-docs)
- Not appropriate scientifically
- Too junior
- Limited experience as a mentor
- Limited funds to support proposed research

Possible Problems Specific for Mentored Fellowship Awards

Institution

- Limited scientific/technical resources
- Limited career development opportunities
- Limited opportunities for career advancement

Elements of a Good Proposal

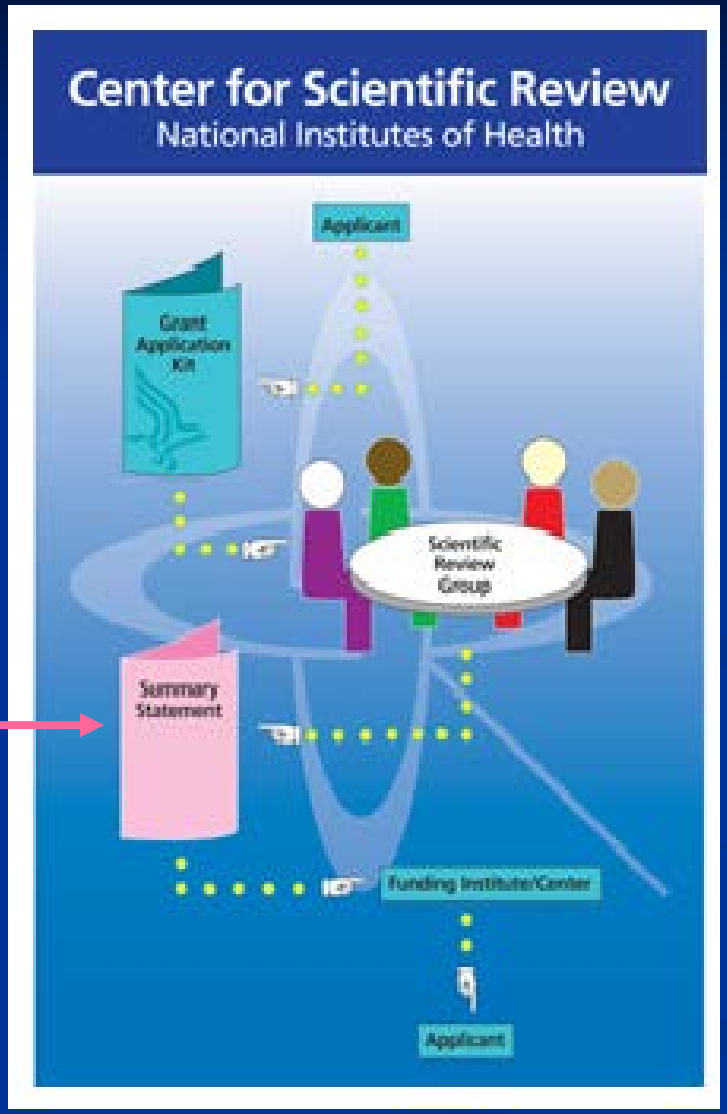
- Feasible
- Relevant
- Unique
- Innovative
- Clear
- Brief
- Consistent

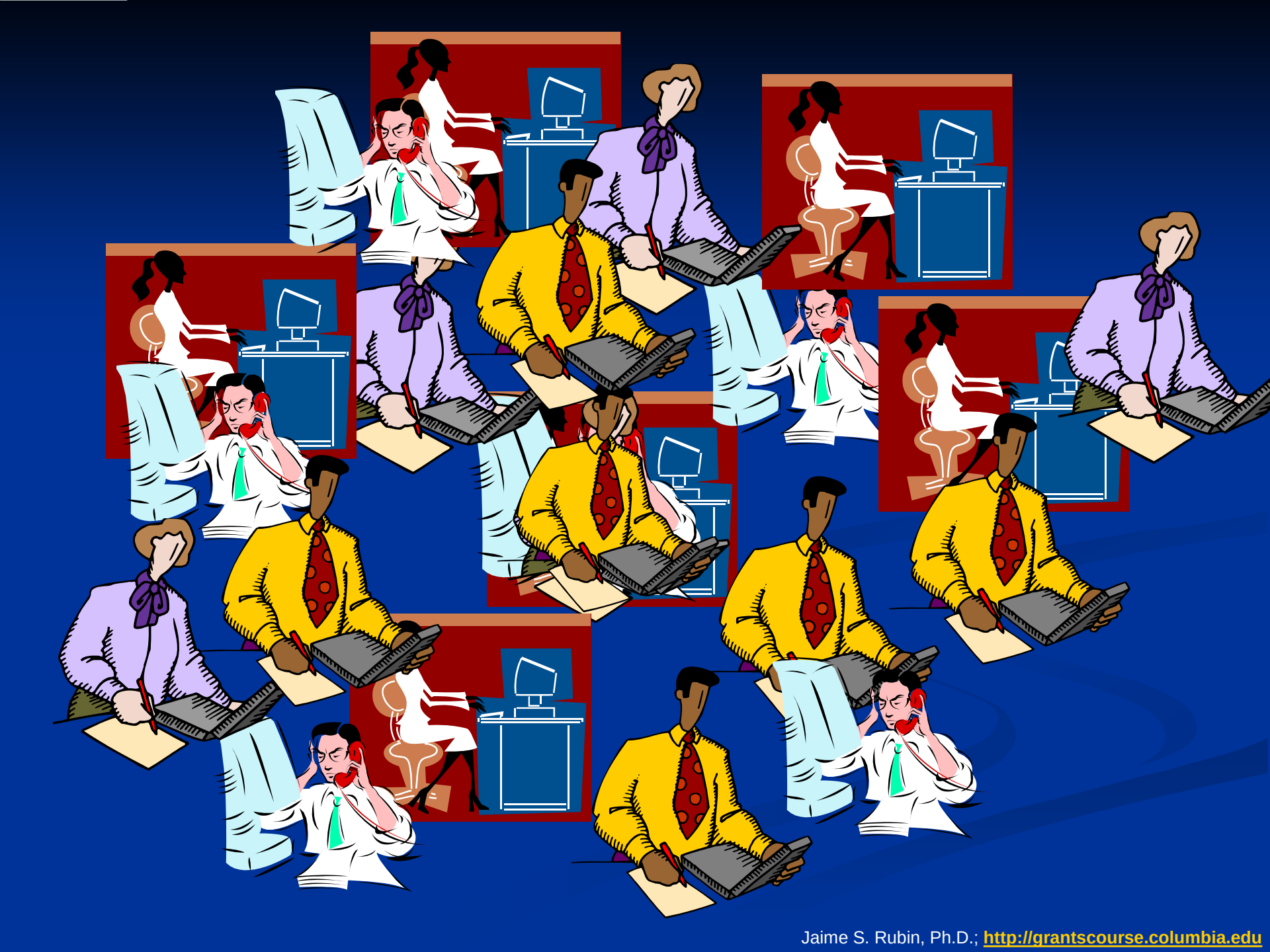
Common Problems with Grant Applications from New Investigators

- Does not address/follow funding agency's mission, specific instructions, budget limits, etc.
- 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

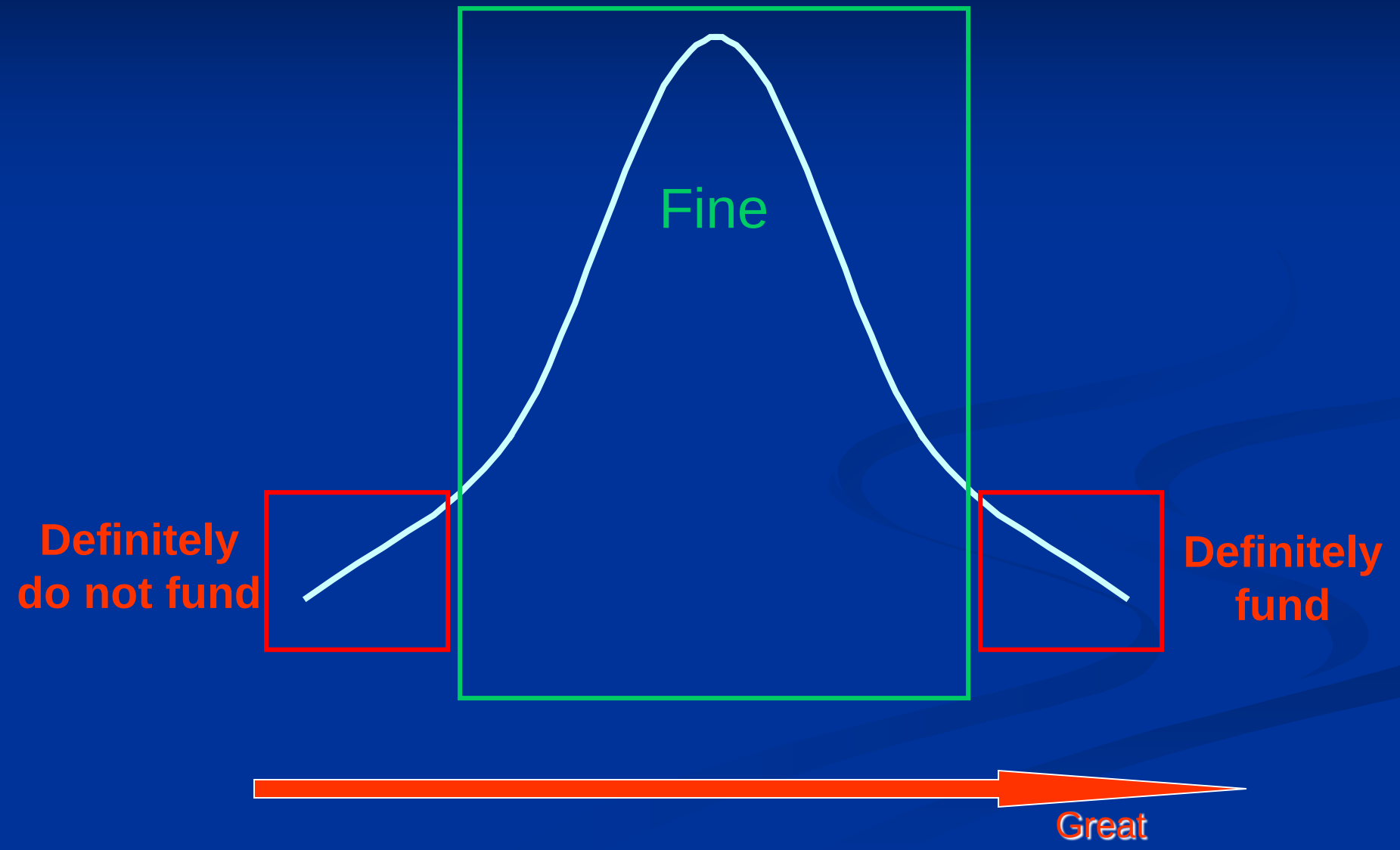
NIH: one round of applications

Pink Sheet: Reviewers' Comments





Bell Curve of Reviewer's Grant Applications

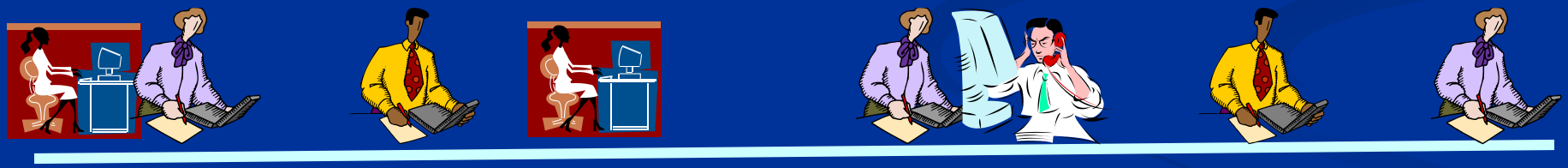


Poor Statistics

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

Good Luck!