New Challenges for Maintaining (Let Alone Enhancing) the Physician-Investigator Pipeline in 2015

Third Consensus Conference on the Physician-Investigator Workforce

Alliance for Academic Internal Medicine

November 12, 2015

National Institutes of Health

Physician-Scientist Workforce Working Group Report

June, 2014

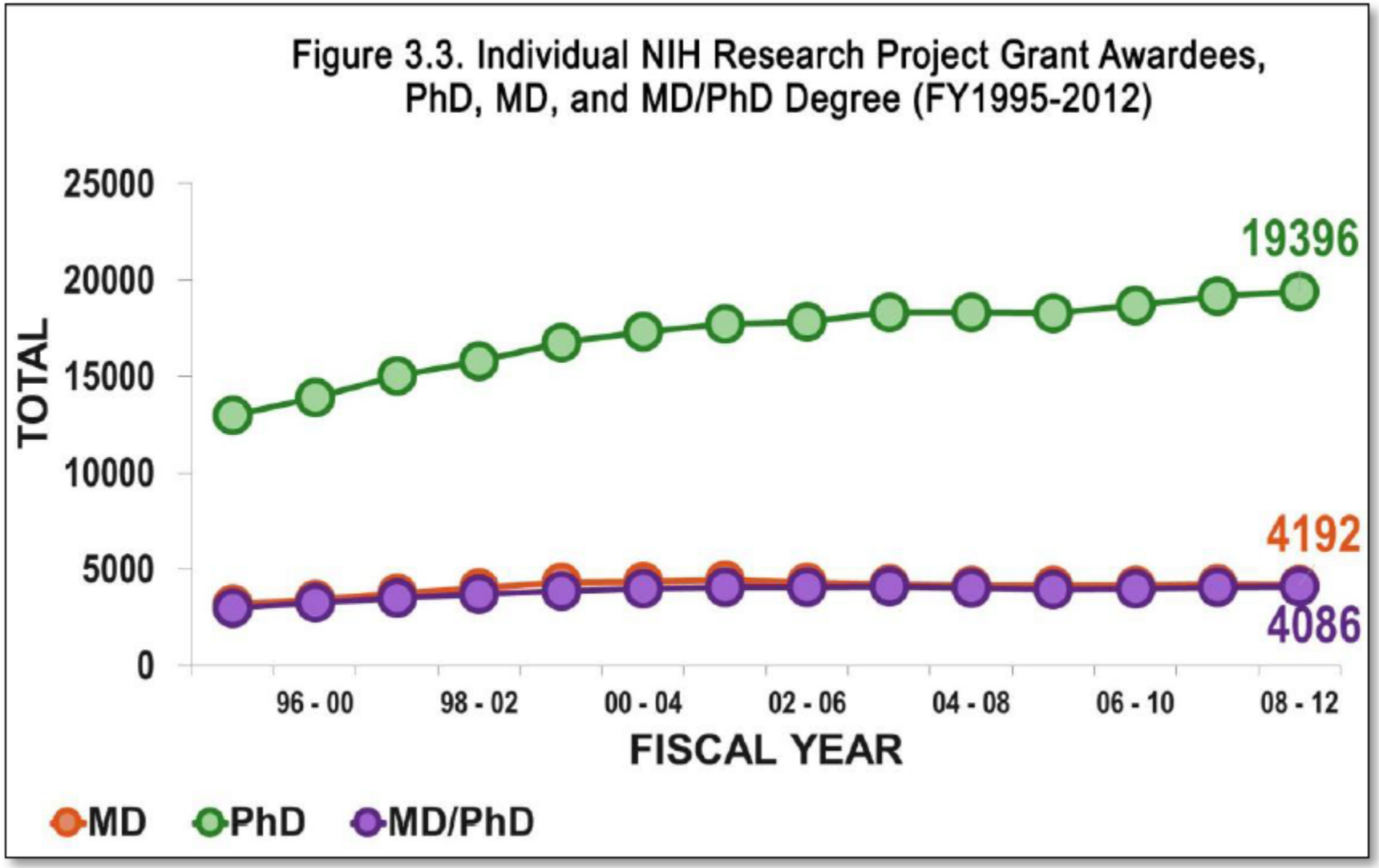


Figure 3.3. Individual NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1995-2012)
25000
20000
15000
10000
5000
0
TOTAL
19396
4192
4086
96 - 00
98 - 02
00 - 04
02 - 06
04 - 08
06 - 10
08 - 12
FISCAL YEAR
MD
PhD
MD/PhD

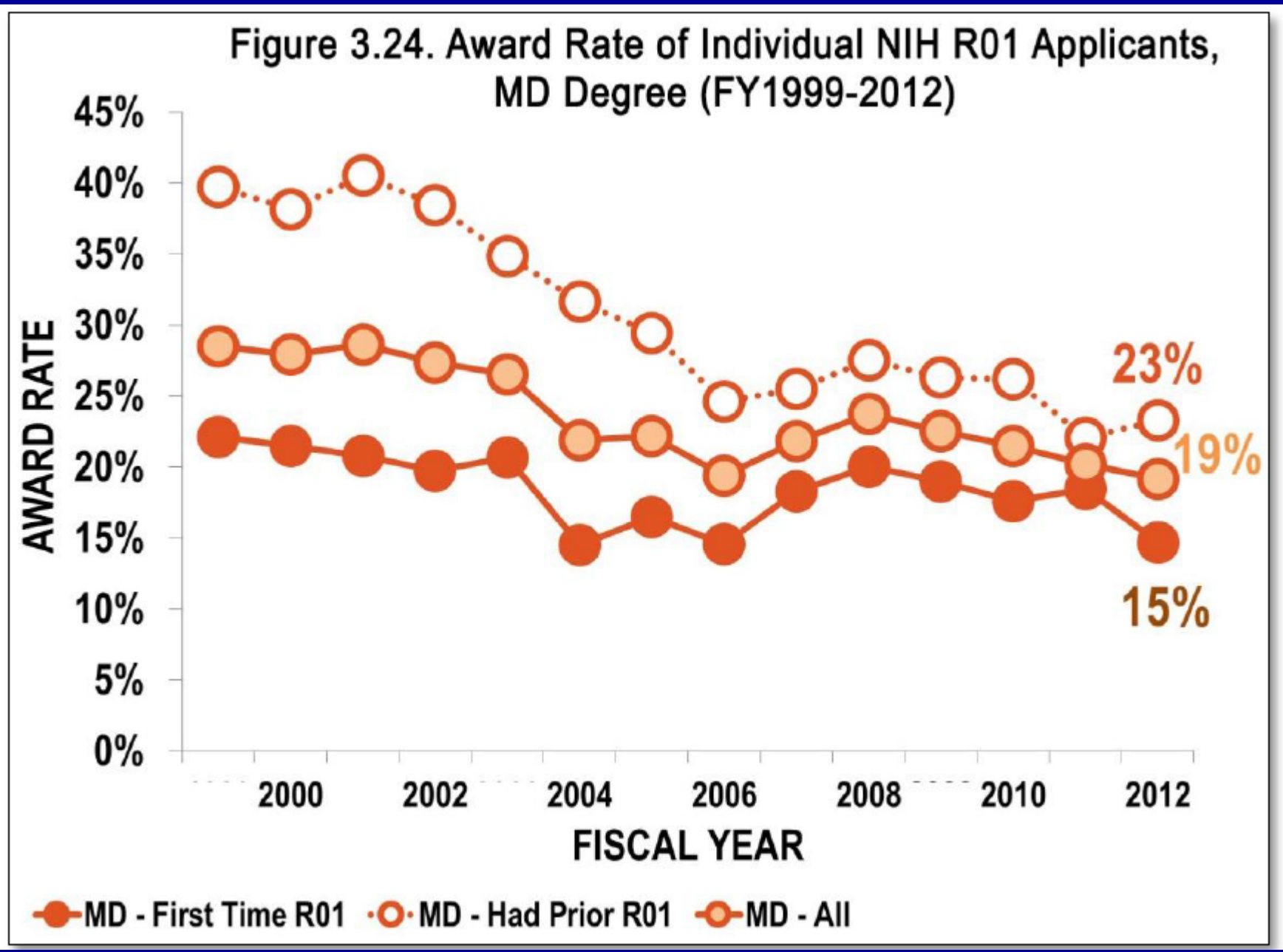


Figure 3.24. Award Rate of Individual NIH R01 Applicants, MD Degree (FY1999-2012)
AWARD RATE
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
2000
2002
2004
2006
2008
2010
2012
FISCAL YEAR
23%
19%
15%
MD - First Time R01
MD - Had Prior R01
MD - All

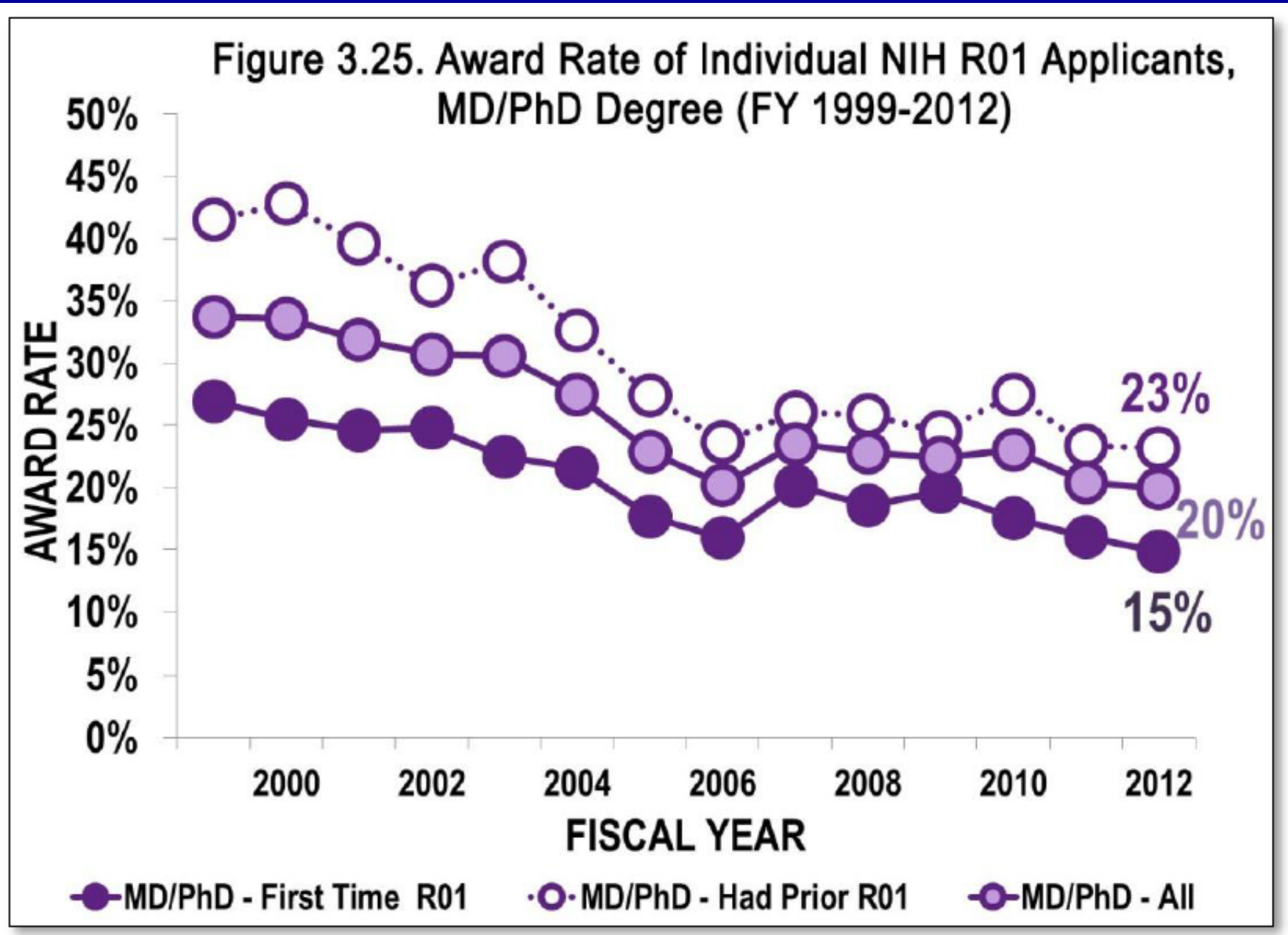


Figure 3.25. Award Rate of Individual NIH R01 Applicants, MD/PhD Degree (FY 1999-2012)
AWARD RATE
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
2000
2002
2004
2006
2008
2010
2012
FISCAL YEAR
23%
20%
15%
MD/PhD - First Time R01
MD/PhD - Had Prior R01
MD/PhD - All

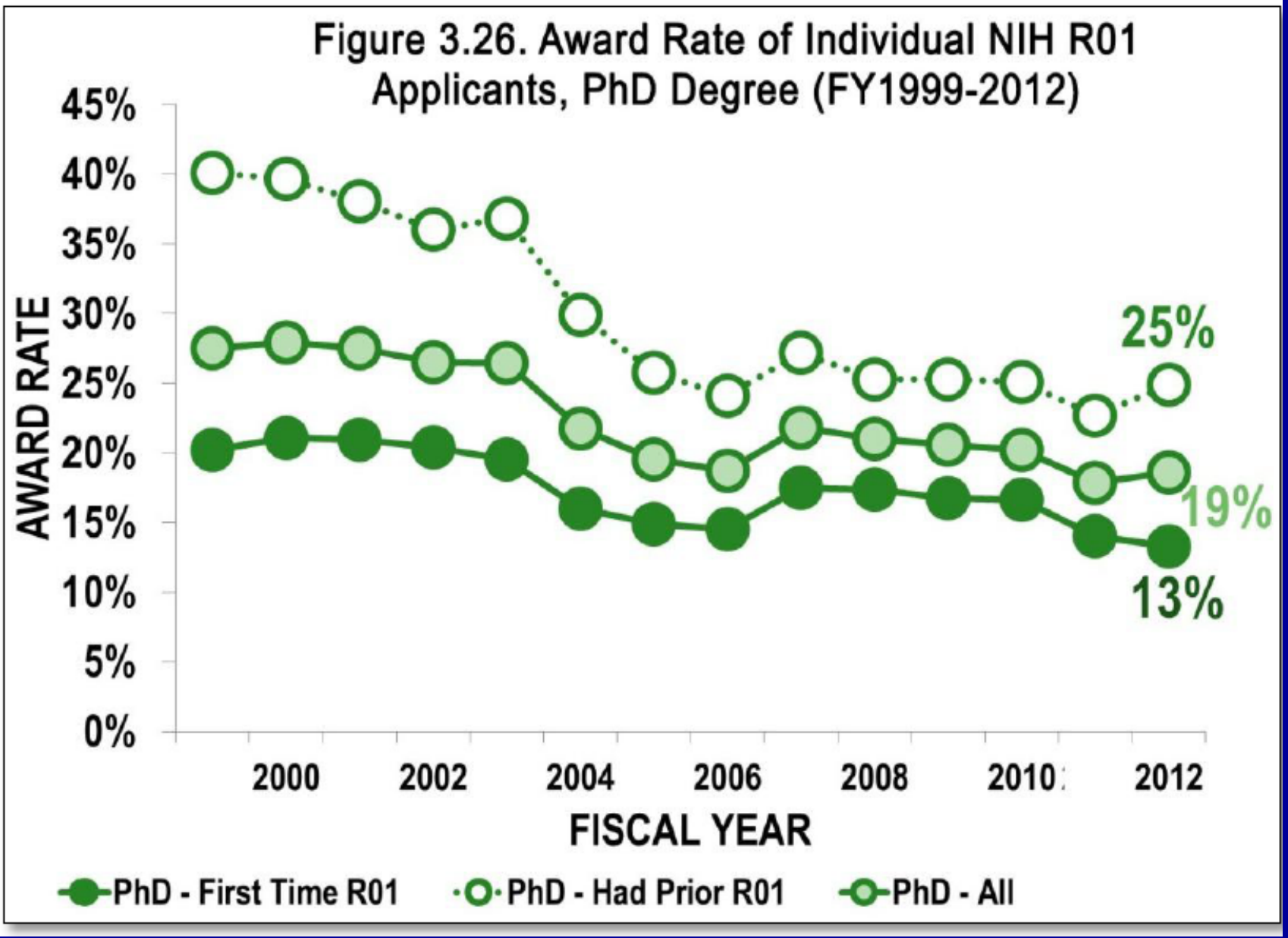
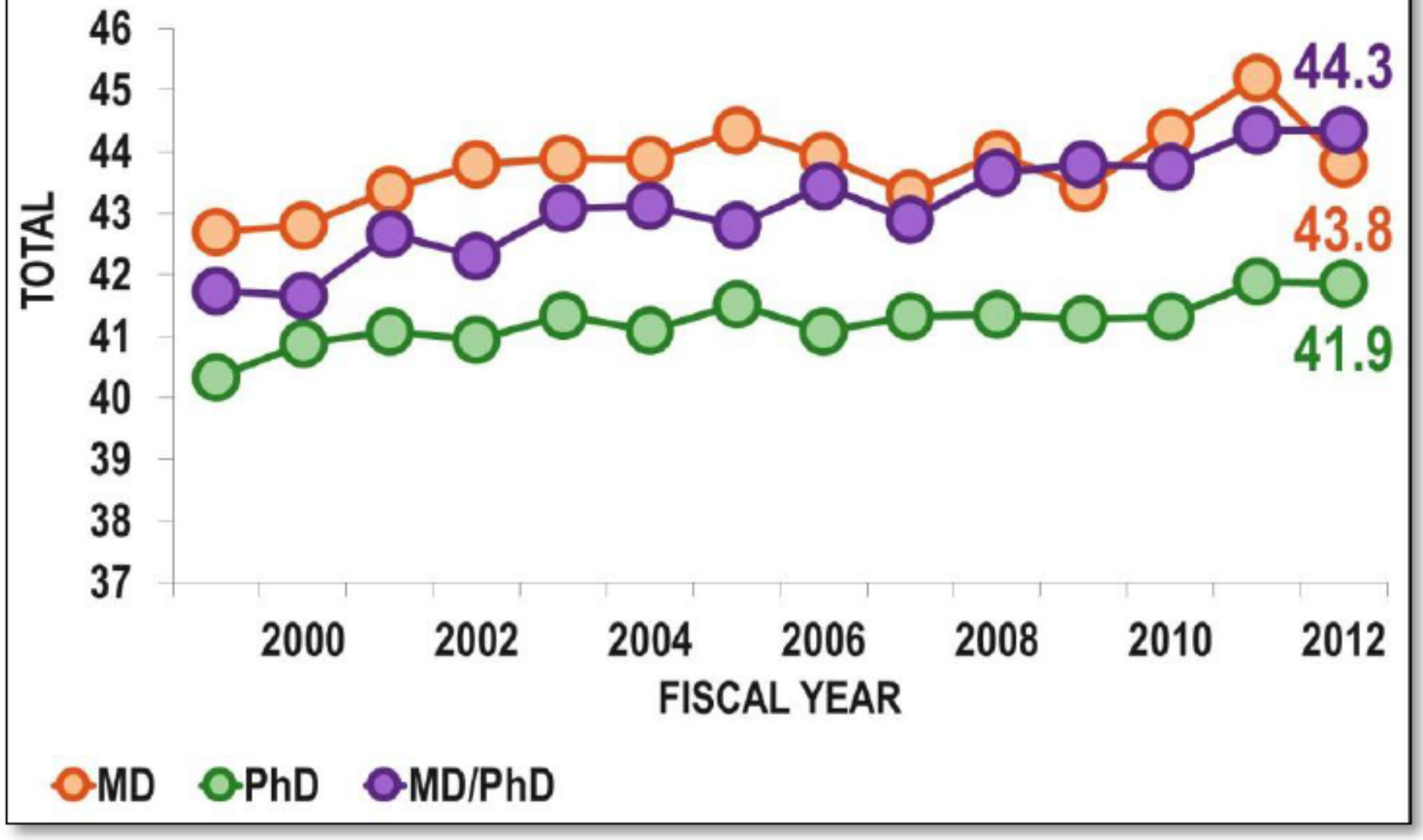
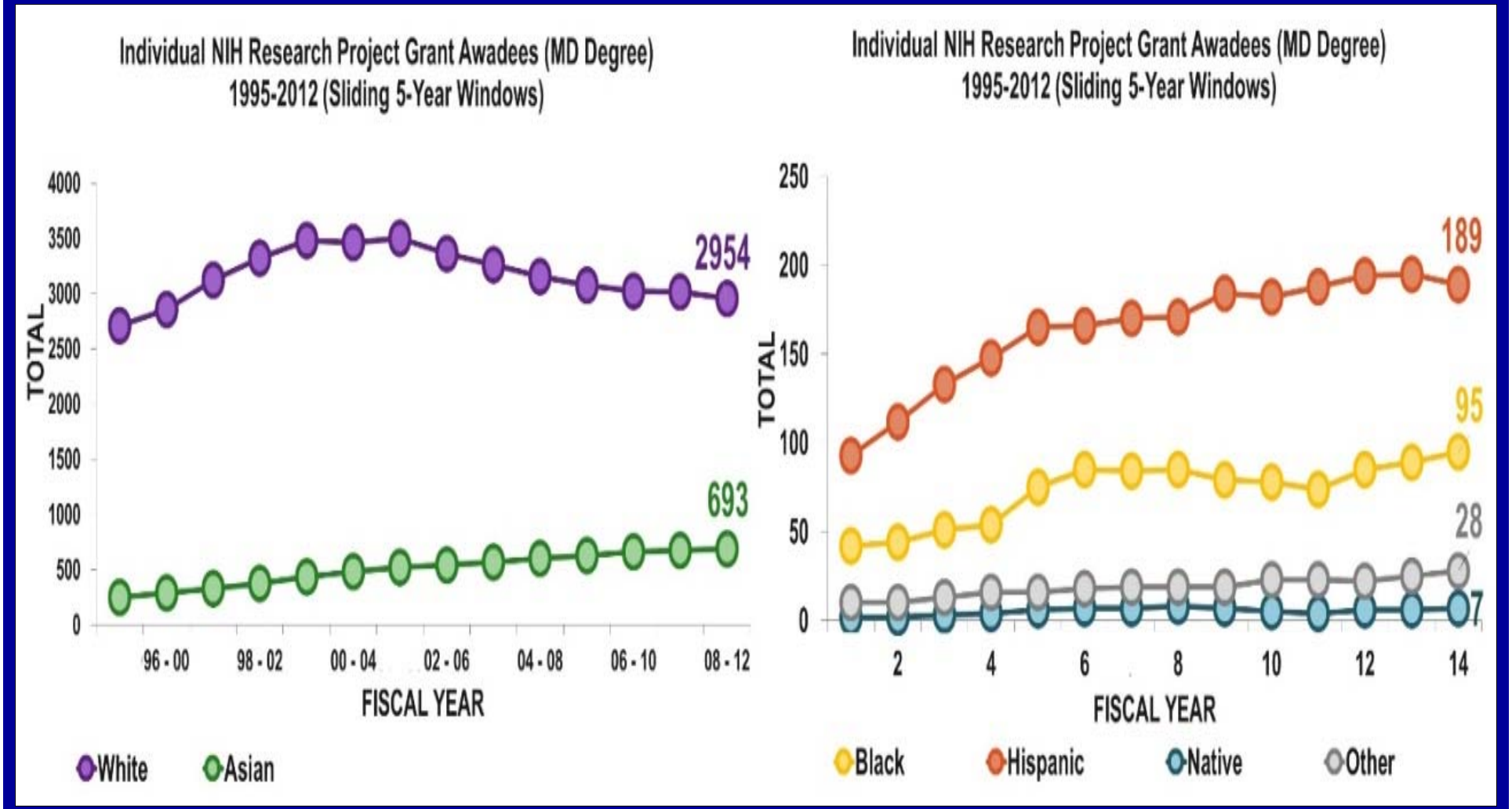


Figure 3.26. Award Rate of Individual NIH R01 Applicants, PhD Degree (FY1999-2012)
AWARD RATE
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
2000
2002
2004
2006
2008
2010
2012
FISCAL YEAR
25%
19%
13%
PhD - First Time R01
PhD - Had Prior R01
PhD - All

Figure 3.11. Average Age of First-time NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)




Individual NIH Research Project Grant Awadees (MD Degree)
1995-2012 (Sliding 5-Year Windows)
TOTAL
4000
3500
3000
2500
2000
1500
1000
500
0
2954
693
96 - 00
98 - 02
00 - 04
02 - 06
04 - 08
06 - 10
08 - 12
FISCAL YEAR
White
Asian
Individual NIH Research Project Grant Awadees (MD Degree)
1995-2012 (Sliding 5-Year Windows)
TOTAL
250
200
150
100
50
0
189
95
28
7
2
4
6
8
10
12
14
FISCAL YEAR
Black
Hispanic
Native
Other

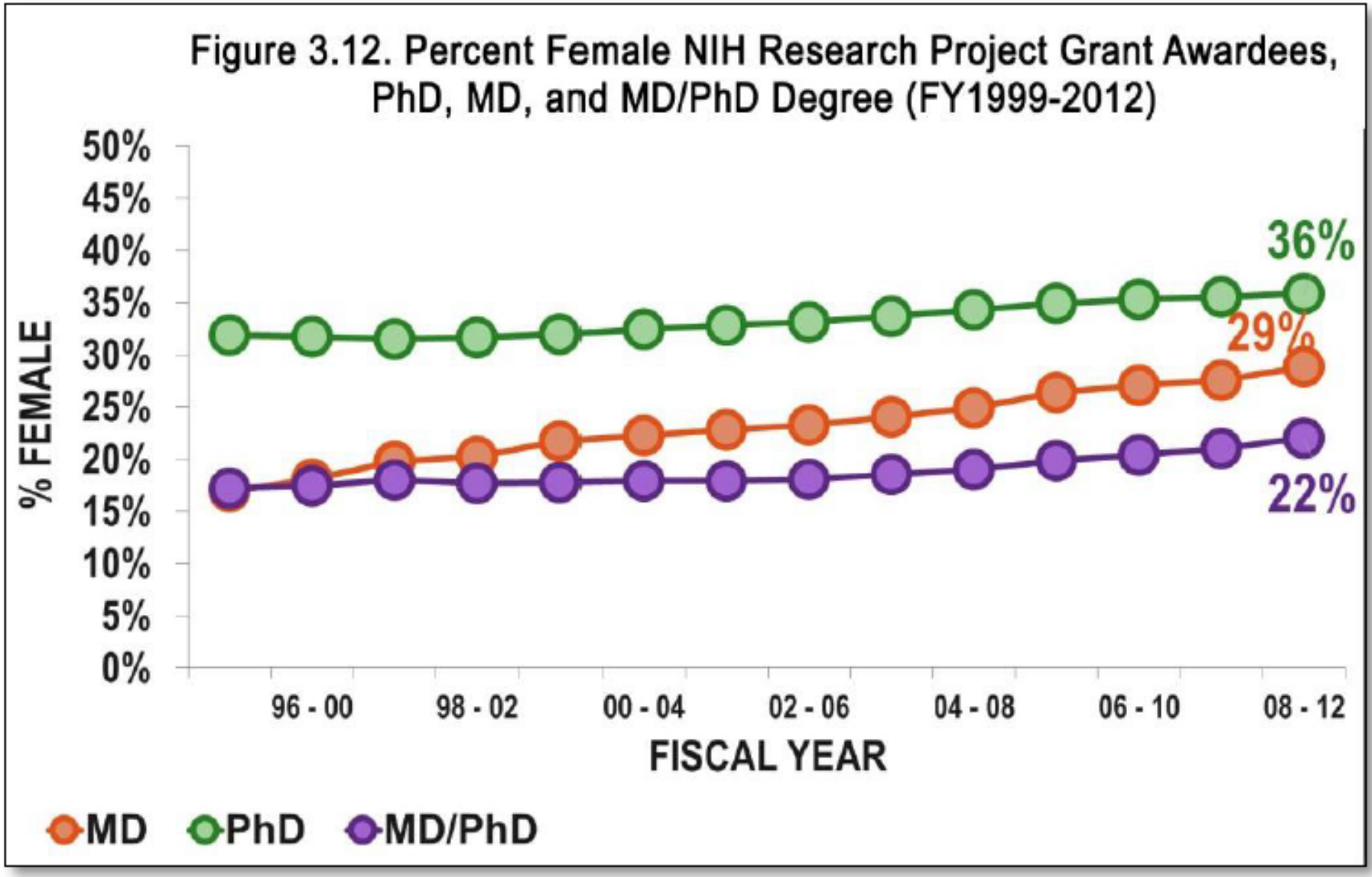


Figure 3.12. Percent Female NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)
% FEMALE
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
36%
29%
22%
96 - 00
98 - 02
00 - 04
02 - 06
04 - 08
06 - 10
08 - 12
FISCAL YEAR
MD
PhD
MD/PhD


Humanism
Science

TRANSLATIONAL RESEARCH

Core Principle:

Harnessing The Power Of The Scientific Method To Promote Health And Alleviate Suffering From Disease Is Humankind's Proudest Achievement

Translational Research

Key Corollary:

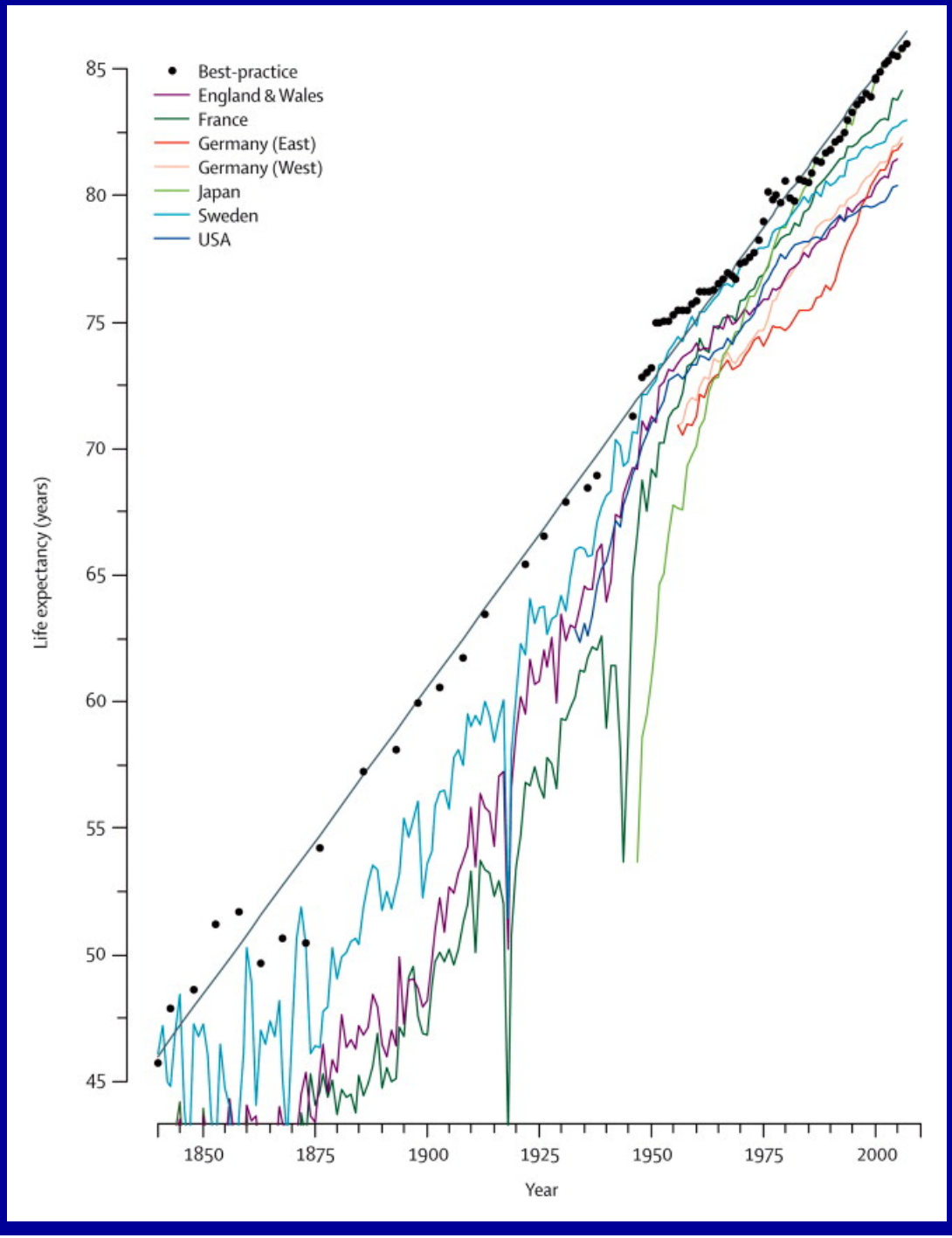
Research Is Not One Of The Three Missions Of Academic Medicine, It Is THE Mission.

The 3-Legged Stool

Research	Patient Care	Education

The 4-Legged Stool with Cushion

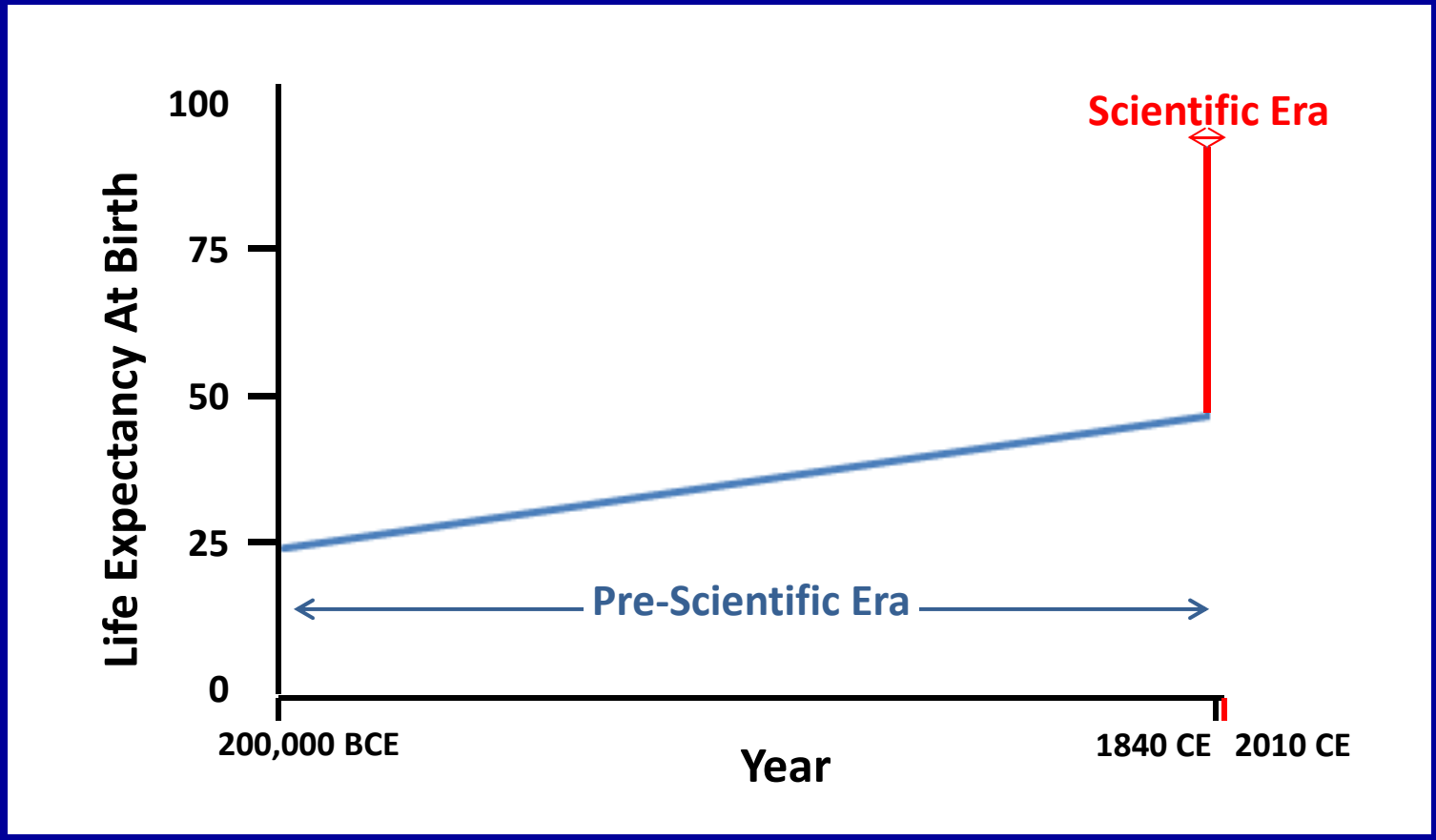
RESEARCH			
Patient Care	Education	Community Service	Global Health
		Social Justice	



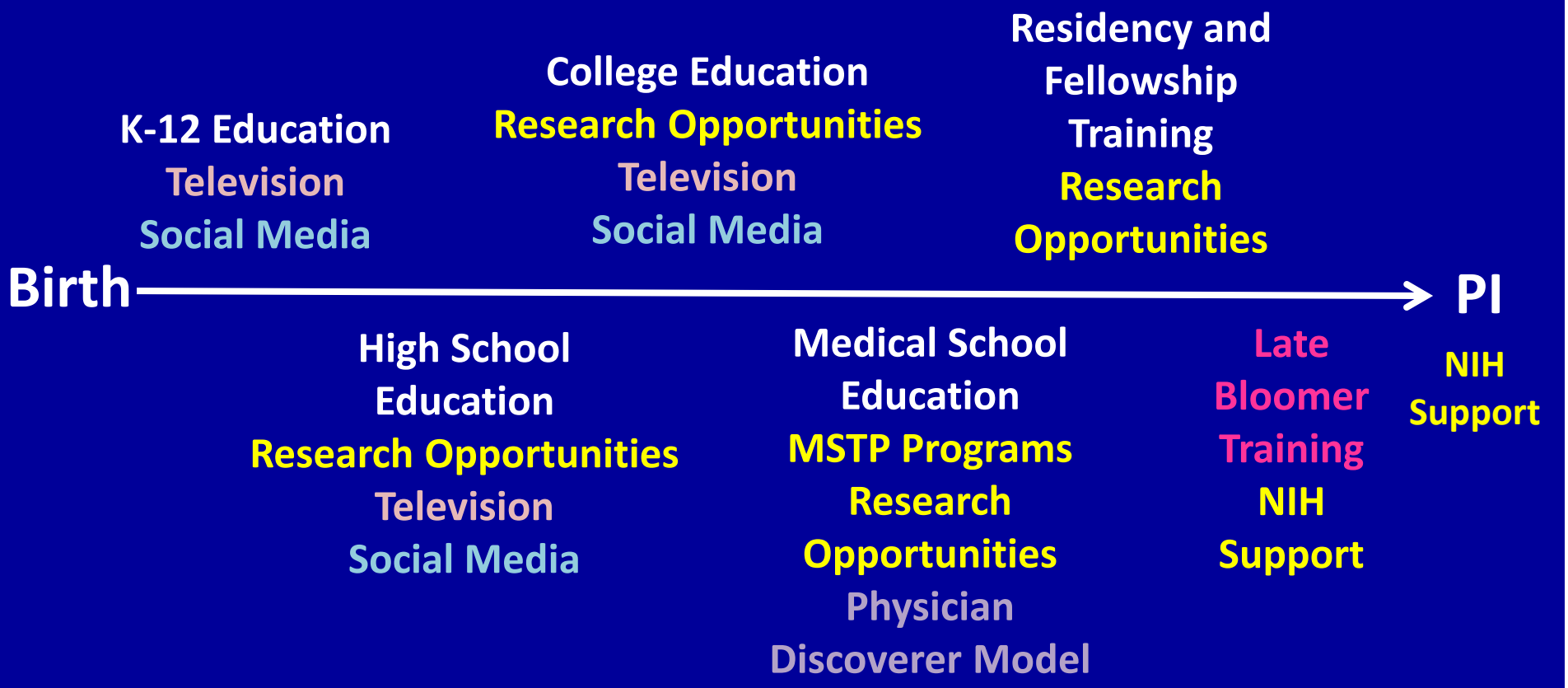
Best-Practice Life Expectancy and Life Expectancy for Women in Selected Countries 1840-2007

(Christensen et al., Lancet 374:1196, 2009)

Life Expectancy at Birth for Homo Sapiens



Physician-Investigator Pipeline



Physician Investigator Pipeline

Culture of Physicians as Discovers

Definition of a Clinical Physician Investigator

"[We] are considered to be clinicians by physiologists, biochemists, and immunologists;

Dr. Isaac Starr; President ASCI, 1940

Definition of a Physician Investigator?

"[We] are considered to be clinicians by physiologists, biochemists, and immunologists; and considered to be physiologists, biochemists, or immunologists by most clinicians."

Dr. Isaac Starr; President ASCI, 1940

Factors that Have Eroded the Physician-Discoverer Model

1. The Prolonged Gestations for Both Clinical Medicine and Basic Investigation
2. The Structure of Specialty Training and Board Certification
3. Demise of the Autopsy as a Central Educational Experience and Separation of Pathology from Clinical Departments
4. CLIA and the Loss of the Housestaff Lab

Factors that Have Eroded the Physician-Discoverer Model

5. Introduction of Faculty “Tracks” and Growth of a Dedicated Cadre of Physician Educators with Relatively Little Primary Discovery Experience
6. Focus on Medical Humanities
7. Growth of PhD Research Population (“Outsourcing Research Mission”)

Factors that Have Eroded the Physician-Discoverer Model

8. Hidden Curriculum Related to Medical Care Creates Intellectual Conservatism and Risk Aversion that Doesn't Encourage Discovery (Evidence-Based Medicine, Standard of Care, Practice Guidelines, 6 Sigma, Malpractice Litigation)
9. Debasing of observational science, case reports, and single clinical observations ("anecdotal") in favor of large randomized trials
10. Need to Bridge 2 Cultures

TWO CULTURES

Medicine	Basic Science
Timely Action Required Regardless of Certainty	Reserve Judgment Until Evidence Compelling
Focus on That Which Is Unique	Focus on The Reproducible and Generalizable
Many Uncontrolled Variables	All Variables Identified and Controlled

TWO CULTURES

Medicine	Basic Science
Follow Practice Guidelines And Standard Of Care	Be Bold And Take Risks
Error May Imperil Someone's Life And Create Malpractice Liability	Error Is Expected And Valuable In Framing New Hypotheses
Physicians Apply New Knowledge	Scientists Discover New knowledge

TWO CULTURES

Medicine	Basic Science
Patient flow steady	Need to generate ideas
Respect for Expert Opinion	Suspicion of Expert Opinion
Oath	No Oath

TWO CULTURES

Medicine	Basic Science
Patient flow steady	Need to generate ideas
Respect for Expert Opinion	Suspicion of Expert Opinion
Oath	No Oath
Suit and Tie	Jeans and T-Shirt

Proposed Addition to Hippocratic Oath

"That I will advance the science of medicine by experimentation and/or by making careful observations about my patients and I will rapidly disseminate that knowledge to my colleagues so that all patients may benefit."

Physician Investigator Pipeline

Mentoring and Career Path

Mentoring

- **“Mentor” was not a human, but rather a goddess in a mortal’s body**
- **Being mentored should be an active, not a passive, process**
- **Lessons from Negative Mentoring can be very valuable**


NEW
BIG PACKAGE
Mr. and Mrs. Potato Head
FUNNY FACE COMBINATION KIT
LIFE
AND VEGETABLES TO MAKE FUNNY FACE CHARACTERS

Mentoring

The mentor's primary responsibility is to make sure that the trainee makes a great discovery. Then everything else takes care of itself!

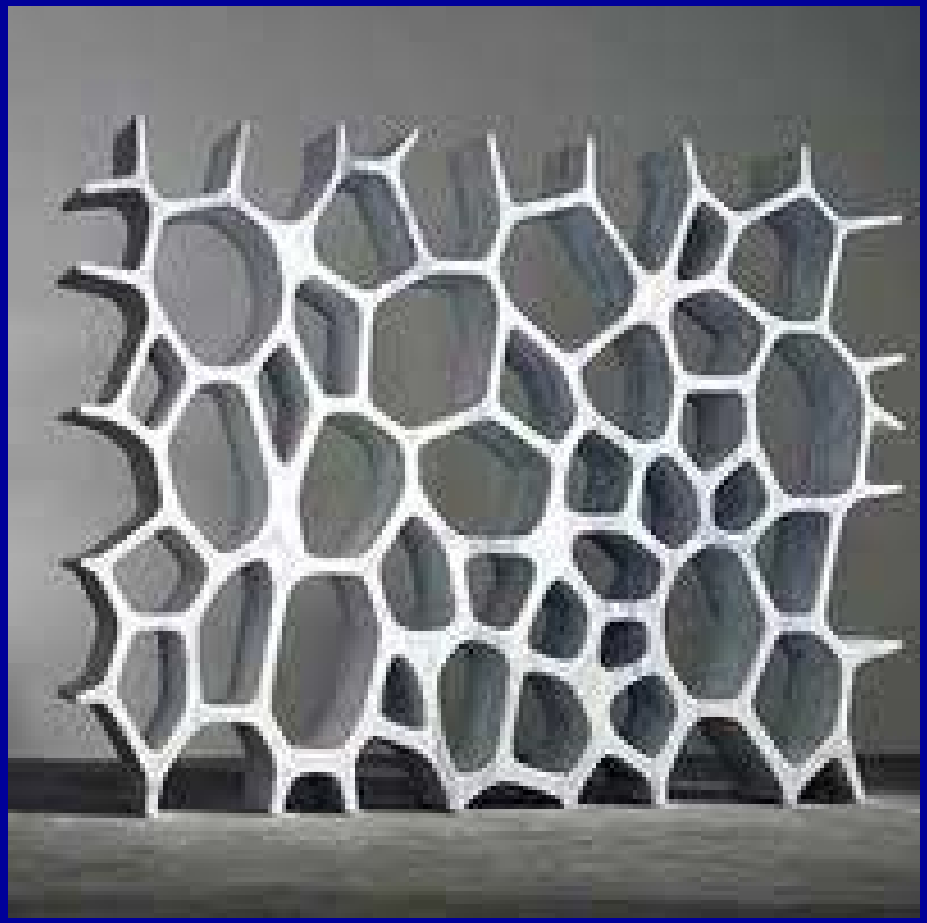
Dr. Ralph Steinman

Career Metaphor Images

Then

Career Metaphor Images

Then



Now

Physician Investigator Pipeline

Board Certification and Recertification

American Board of Internal Medicine

OUR MISSION

To enhance the quality of health care by certifying internists and subspecialists who demonstrate the knowledge, skills, and attitudes essential for excellent patient care.

American Board of Internal Medicine

OUR MISSION

To enhance the quality of health care by certifying internists and subspecialists who demonstrate the knowledge, skills, and attitudes essential for excellent patient care, and to insure the continued growth in scientific knowledge of internal medicine so as to continuously improve the prevention, diagnosis, and treatment of disease.

ABIM: Research Pathway Policies & Requirements

The ABIM Research Pathway is an integrated program that combines training in research with training in clinical internal medicine and its subspecialties. This pathway is recommended only for physicians who intend to *seriously pursue a career in basic science or clinical research*. Physicians who are interested in teaching or practicing internal medicine should pursue the standard three years of internal medicine training

ABIM: Research Pathway Internal Medicine Training

All trainees in the research pathway must satisfactorily complete 24 months of accredited categorical internal medicine training. A minimum of 20 months must involve direct patient care responsibility.

ABIM: Research Pathway Research Training

At least three years of research training at 80 percent commitment **is required.**

The research experience of trainees should be *mentored* and reviewed; *training should include completion of work leading to a graduate degree (if not already acquired) or its equivalent*. The last year of the Research Pathway may be undertaken in a full-time faculty position if the level of commitment to mentored research is maintained at 80 percent.

ABIM: Research Pathway: Clinical Experience During Research Year

During **internal medicine** research training, ***20 percent of each year*** must be spent in clinical experiences including a half-day per week in continuity clinic.

During **subspecialty** research training, ***at least one-half day per week*** must be spent in an ambulatory clinic.

Time spent in continuity outpatient clinic during non-clinical training is in addition to the requirement for full-time clinical training

ABIM: Research Pathway Subspecialty Training (1)

The Research Pathway for Certification in internal medicine and a subspecialty that requires 12 months of clinical training is a *six-year program*. For subspecialties…[that] require more than 12 months of clinical training, and for dual certification…, the Research Pathway is a *full seven-year program*, including *36 to 42 months of research*, depending on the number of months of clinical training completed.

ABIM: Research Pathway Subspecialty Training (2)

For those seeking certification in advanced heart failure and transplant cardiology, clinical cardiac electrophysiology, interventional cardiology and transplant hepatology which require prior certification in cardiovascular disease and gastroenterology, the Research Pathway is an *eight-year program*.

ABIM Recertification

- Model based on full time practitioner, not physician-scientist
- Intended or non-intended consequence is to discourage continued participation of physician-scientists in clinical care
- Physician-scientists who stop participating in clinical care are a depreciating translational research asset
- Can we create a balance between limitation of clinical scope of practice and limitation of recertification expectations?

ABIM: Research Pathway: Clinical Experience During Research Year

Questions

Why should the research pathway:

1. **Be longer than others?**
2. **Require more years of supervised clinical training than others?**
3. **Require mentoring?**
4. **Require a graduate degree or equivalent?**
5. **Include qualifying words such as *seriously* and *full* that raise questions about the candidate's motivation?**

Physician Investigator Pipeline

Training and Infrastructure to Perform Clinical Investigation

The Essentials Skills of the Translational Research Investigator or Team

1. The ability to articulate a health need with the precision of a basic science hypothesis

2. The ability to create a robust, practical, and medically meaningful assay (molecular, cellular, or organismal) to interrogate the system

The Essentials Skills of the Translational Research Investigator or Team

3. The ability to conceptually design a Phase 3 study to assess safety and efficacy and/or a path to clinical adoption

Features of the Rockefeller Philosophy and Tradition

- Flat University administrative structure with ~77 Laboratory Heads reporting directly to President and no departments
- Lab heads: 59 PhDs; 6 MDs; 11 MD,PhDs
- University grants PhD and, since 2006, Master's in Clinical and Translational Science
- MD-PhD program with Cornell and MSKCC (Tri-I) for 40 years
- All patients in the Hospital are on a research protocol.

Features of the Rockefeller Philosophy and Tradition

- Physicians should be fully salaried and not engage in private practice. Therefore, all faculty have guaranteed salaries.
- Trainees should learn by doing and devote 100% effort to their research. Therefore, they only perform clinical work pro bono related to their research and/or to maintain their clinical skills. “Moonlighting” only allowed on campus.
- Research participants should not pay for their medical or hospital care. Therefore, the University subsidizes the clinical costs of the hospital

Rockefeller University Center for Clinical and Translational Science

Clinical Scholars Program (1)

1. Eligibility: M.D. or Health-Related Ph.D.
2. 3 Year Master's Degree Program
3. Mentored Human Studies protocols
4. Complementary Didactic Experiences:
   a) Weekly tutorial in clinical and translational research
   b) Weekly seminar by distinguished clinical and translational investigator
   c) Weekly luncheon with seminar speaker
   d) Biostatistical and Bioinformatics tutorials
   e) Graduate School course requirement

Rockefeller University Center for Clinical and Translational Science

Clinical Scholars Program (2)

4. Complementary Didactic Experiences (cont'd):

f) Entrepreneurship curriculum

g) Phenotype recording instruments

h) Course in Searching Big Data for T1 Investigators

i) Humanities in Medicine curriculum

Protocol Development and Approval at Rockefeller

Idea

↓ Navigation Process

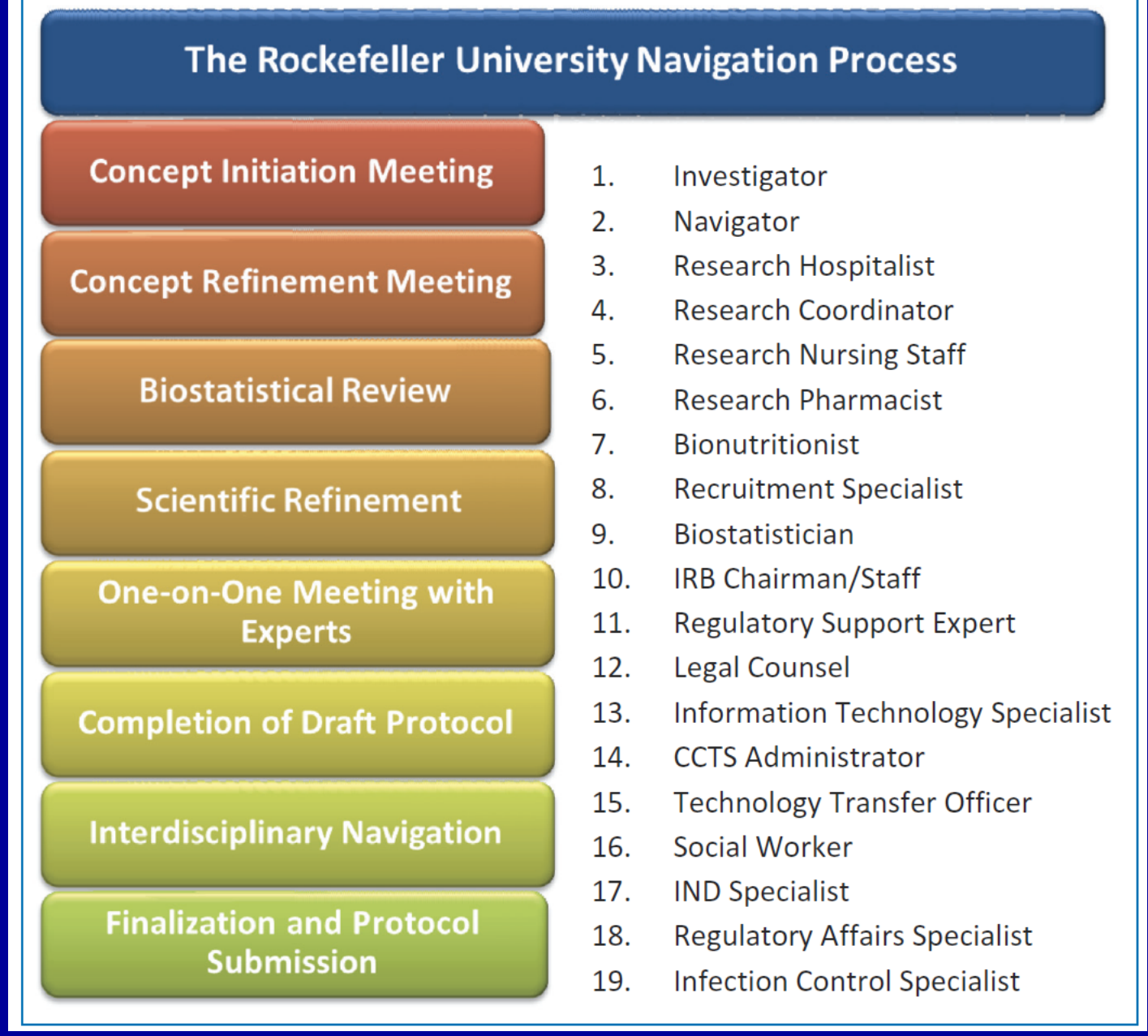
Protocol

↓

Review and Approval by Advisory Committee for Clinical and Translational Science (ACCTS)

↓

Approval by Institutional Review Board (IRB)


The Rockefeller University Navigation Process
Concept Initiation Meeting
Concept Refinement Meeting
Biostatistical Review
Scientific Refinement
One-on-One Meeting with Experts
Completion of Draft Protocol
Interdisciplinary Navigation
Finalization and Protocol Submission
1. Investigator
2. Navigator
3. Research Hospitalist
4. Research Coordinator
5. Research Nursing Staff
6. Research Pharmacist
7. Bionutritionist
8. Recruitment Specialist
9. Biostatistician
10. IRB Chairman/Staff
11. Regulatory Support Expert
12. Legal Counsel
13. Information Technology Specialist
14. CCTS Administrator
15. Technology Transfer Officer
16. Social Worker
17. IND Specialist
18. Regulatory Affairs Specialist
19. Infection Control Specialist

Navigation

ARTICLE

The Rockefeller University Navigation Program: A Structured Multidisciplinary Protocol Development and Educational Program to Advance Translational Research

Donna Brassil, M.A., Rhonda G. Kost, M.D., Kathleen A. Dowd, B.S.N., Arlene M. Hurley, A.N.P., Tyler-Lauren Rainer, B.A., and Barry S. Coller, M.D.

Abstract

The development of translational clinical research protocols is complex. To assist investigators, we developed a structured supportive guidance process (Navigation) to expedite protocol development to the standards of good clinical practice (GCP), focusing on research ethics and integrity. Navigation consists of experienced research coordinators leading investigators through a concerted multistep protocol development process from concept initiation to submission of the final protocol. To assess the effectiveness of Navigation, we collect data on the experience of investigators, the intensity of support required for protocol development, IRB review outcomes, and protocol start and completion dates. One hundred forty-four protocols underwent Navigation and achieved IRB approval since the program began in 2007, including 37 led by trainee investigators, 26 led by MDs, 9 by MD/PhDs, 57 by PhDs, and 12 by investigators with other credentials (e.g., RN, MPH). In every year, more than 50% of Navigated protocols were approved by the IRB within 30 days. For trainees who had more than one protocol navigated, the intensity of Navigation support required decreased over time. Navigation can increase access to translational studies for basic scientists, facilitate GCP training for investigators, and accelerate development and approval of protocols of high ethical and scientific quality. Clin Trans Sci 2014; Volume #: 1–8

34 Rockefeller Laboratories

Navigation

ARTICLE

Clin Transl Sci 2014

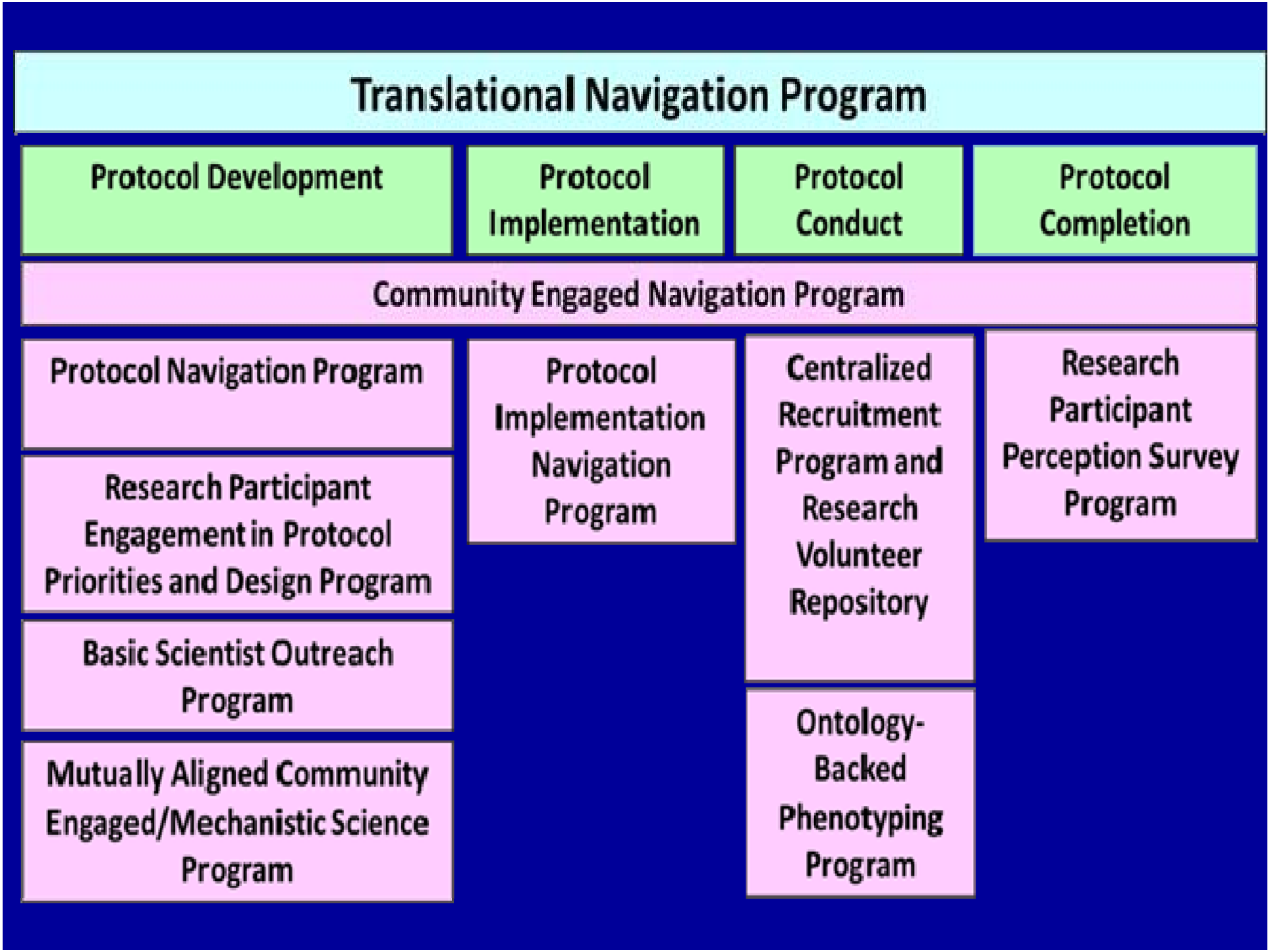
The Rockefeller University Navigation Program: A Structured Multidisciplinary Protocol Development and Educational Program to Advance Translational Research

Donna Brassil, M.A., Rhonda G. Kost, M.D., Kathleen A. Dowd, B.S.N., Arlene M. Hurley, A.N.P., Tyler-Lauren Rainer, B.A., and Barry S. Coller, M.D.

- **34/77 Rockefeller Laboratories have human subjects protocols**
- **21 Laboratories with PhD Lab Head have human subjects protocols**
- **88% of protocols Navigated in 2014-2015 approved by the ACCTS and IRB within 30 days of submission**

CCTS Protocol Conduct Support

- Participant Recruitment
- Clinical Research Coordination
- Research Nursing and Hospitalist
- Bionutrition
- Research Pharmacy
- Regulatory Support
- Data Organization and Protection
- Biostatistical and Research Design
- Bioinformatics Analysis
- Auditing and monitoring


Translational Navigation Program
Protocol Development
Protocol Implementation
Protocol Conduct
Protocol Completion
Community Engaged Navigation Program
Protocol Navigation Program
Research Participant Engagement in Protocol Priorities and Design Program
Basic Scientist Outreach Program
Mutually Aligned Community Engaged/Mechanistic Science Program
Protocol Implementation Navigation Program
Centralized Recruitment Program and Research Volunteer Repository
Ontology-Backed Phenotyping Program
Research Participant Perception Survey Program

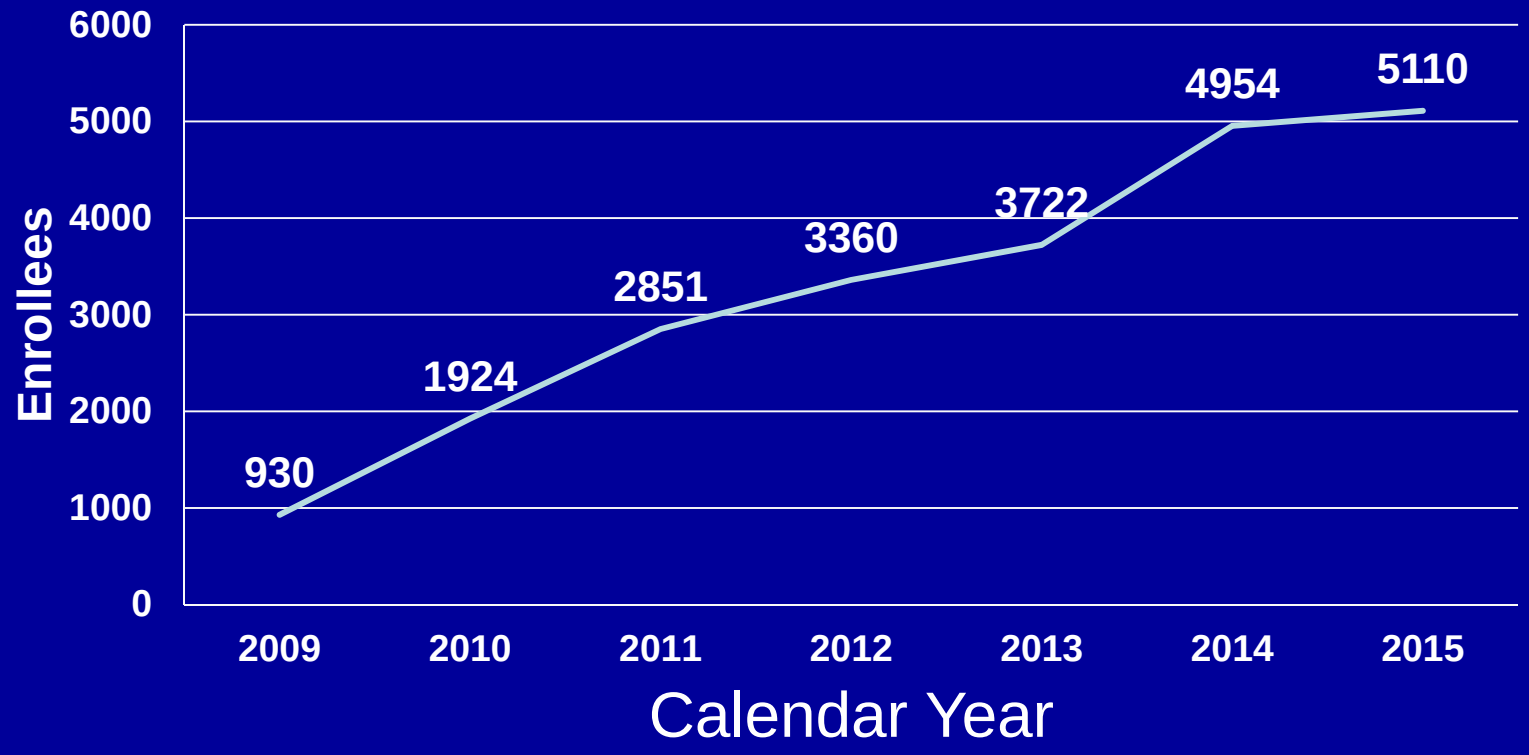
Recruitment

A Data-Rich Recruitment Core to Support Translational Clinical Research

Rhonda G. Kost, M.D.[1], Lauren M. Corregano, M.S.W.[1], Tyler-Lauren Rainer, B.A.[1], Caroline Melendez, B.A.[1,2], and Barry S. Coller, M.D.[1]

Clin Transl Sci 2014

Enrollment in the Rockefeller Research Volunteer Repository 2009-2015



CTSA PROFILE

The Research Hospitalist: Protocol Enabler and Protector of Participant Safety

BARBARA O'SULLIVAN, M.D., M.P.H.[1], AND BARRY S. COLLER, M.D.[2]

Clin Transl Sci 8:174, 2014

Protocol development (navigation)

- Assess clinical feasibility*
- Plan to manage anticipated clinical events*
- Plan to manage incidental findings*
- Design clinical screening consistent with current practices*
- Develop clinical safety plan*
- Define role of RH and research NP in study+
- Identify specialized credentialing or training needed+
- Identify facility set up requirements‡
- Identify need to customize or adapt environment‡
- Identify need to customize or adapt processes§
- Identify processes to optimize scientific integrity§

Protocol review at IRB & ACCTS

- Review for safety and ethical issues*
- Suggest changes to science for optimal safety*
- Review adequacy of clinical support for study+
- Review resource limitations that may hinder study‡
- At ACCTS, present resource allocation challenges‡
- Chair ACCTS subcommittee on research resources‡
- Present processes and monitoring plan to ACCTS/IRB§

Protocol Initiation

- Final review of processes in place for safety*
- Final definition of clinical support roles+
- Final review of clinical unit readiness for study‡
- Review new processes with relevant personnel§

Recruitment

- Address issues that alter risk*
- Address clinical questions during recruitment and screening+
- Respond to unexpected resource needs that arise‡
- Review revised criteria for impact on processes§

Study Enrollment & Conduct

- Real-time review of EKG, lab, AEs and x-rays*
- Review protocol deviations in real time*
- Assess impact of deviations on study subject*
- Assess impact of deviations on study conduct*
- Real-time assessment of inpatient admissions+
- Address clinical issues with investigators, staff, and participants+
- Manage acute medical emergencies+
- Monitor actual resource use compared with projections‡
- Review deviations/violations to inform process improvement§

Analysis & Study Closure

- Review clinical findings in study with PI and staff*§
- Assist PIs to obtain missing clinical data+
- Assist PIs to close AEs+
- Review resource challenges of specialized equipment‡

ACCTS = Advisory Committee For Clinical And Translational Science; AE = adverse event; IRB = Institutional Review Board; NP = nurse practitioner; PI = principal investigator; RH = research hospitalist.

Converting the Valley of Death into the Garden of Eden

Target Identification	Hit to Lead	Lead to IND	Phase 1
Pilot Projects	Tri-I TDI	RUH Pharm-acist	RUH and CCTS
RU HTS			
Therapeutic Development Fund		Therapeutic Development Fund	

Rockefeller Early Phase Physician Scientists Program (REPPS)

- K-08 and K-23 Awardees
- Focus on:
  - Transitioning to scientific independence
  - Sharing scientific achievements and goals
  - Grant writing
  - Career Development
  - Mentoring Skills

Physician Investigator Pipeline

NIH Policies and Programs

Blood Forum

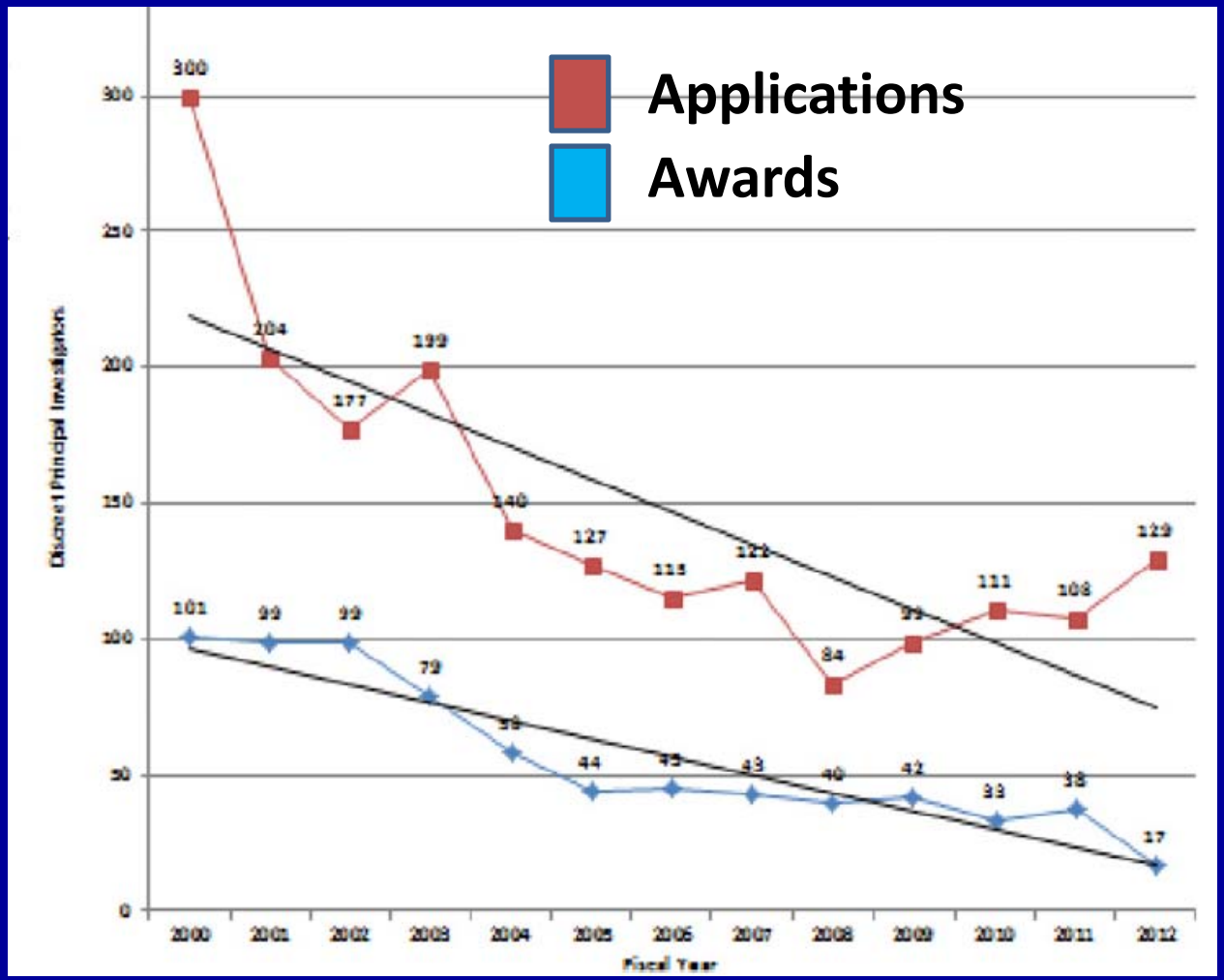
Planning for the future workforce in hematology research

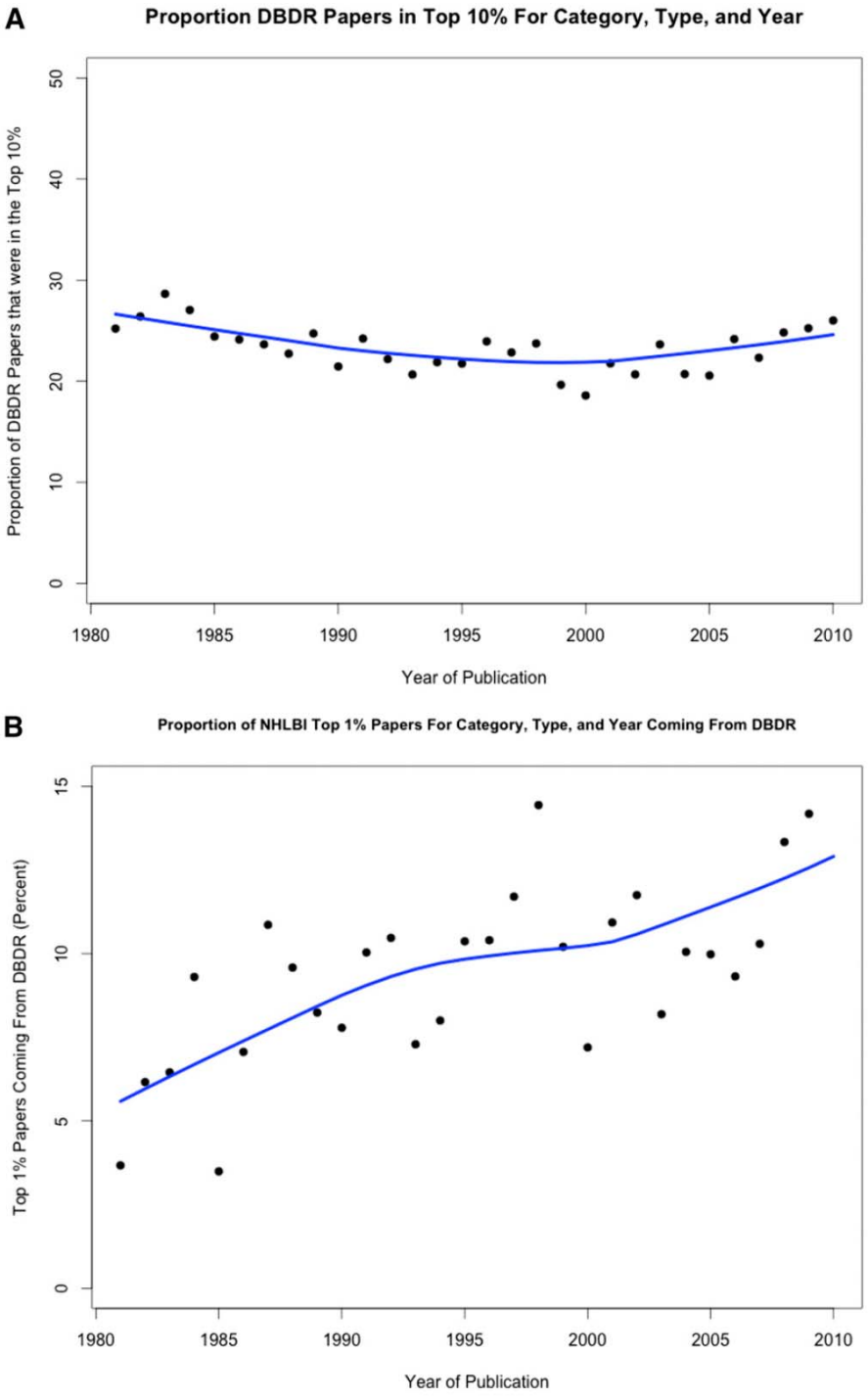
W. Keith Hoots,[1] Janis L. Abkowitz,[2] Barry S. Coller,[3] and Donna M. DiMichele[1]

[1]Division of Blood Diseases and Resources, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD; [2]Division of Hematology, Department of Medicine, University of Washington, Seattle, WA; and [3]Allen and Francis Adler Laboratory of Blood and Vascular Biology, The Rockefeller University Hospital, New York, NY

The medical research and training enterprise in the United States is complex in both its scope and implementation. Accordingly, adaptations to the associated workforce needs present particular challenges. This is particularly true for maintaining or expanding national needs for physician-scientists where training resource requirements and competitive transitional milestones are substantial. For the individual, these phenomena can produce financial burden, prolong the career trajectory, and significantly influence career pathways. Hence, when national data suggest that future medical research needs in a scientific area may be met in a less than optimal manner, strategies to expand research and training capacity must follow. This article defines such an exigency for research and training in nonneoplastic hematology and presents potential strategies for addressing these critical workforce needs. The considerations presented herein reflect a summary of the discussions presented at 2 workshops cosponsored by the National Heart, Lung, and Blood Institute and the American Society of Hematology. (*Blood*. 2015;125(18):2745-2752)

New Investigator-Initiated R01 Principal Investigator Awards NHLBI Division of Blood Disease Research 2000-2013





Ranking by Web of Science of Papers Authored by NHLBI DBDR PIs 1980-2010

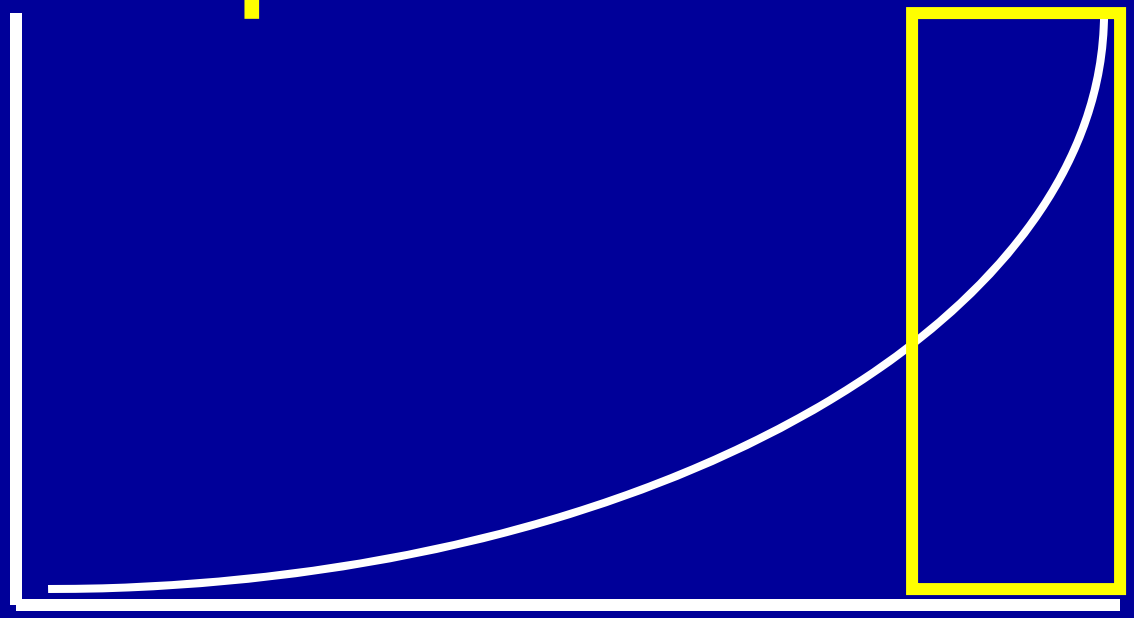
(Hoots et al., Blood 125:2745, 2015)

Major Suggestions to Improve Recruitment to Nonmalignant Hematology

(Hoots et al., Blood 125:2745, 2015)

- Outreach to High School and College Students via TV and other media
- Outreach to Medical Students, including early research experiences
- Provide secure mentored research training programs sufficiently long to achieve scientific independence
- Provide credible career choices with reasonable chance of secure funding

Physician Scientist Productivity Usually is “Back Loaded” With Slow Nucleation Followed by an Exponential Increase



Time

Leveling the Playing Field for Late Bloomer MD Investigators

	Mentored Predoctoral Research Experience	Mentored Postdoctoral Research Experience
PhD and MD PhD	5	4-5
Clinical Fellow		1-2
Clinical Fellow + K08/23		1-2 + 5
Clinical Fellow + K12 + K08/23		1-2 + 3 + ~~5~~

Leveling the Playing Field for MD Investigators

	Mentored Predoctoral Research Experience	Mentored Postdoctoral Research Experience	
PhD and MD-PhD	5	4-5	(9-10)
Clinical Fellow		1-2	(1-2)
Clinical Fellow + K08/23		1-2 + 5	(6-7)
Clinical Fellow + K12 + K08/23		1-2 + 3 + 5	(9-10)

Proposals to Level the Playing Field for MD Investigators

1. 8 year career development (K) award, coupled with a rigorous yearly review of progress

2. NIH-wide policy of allowing physician scientists without PhD degrees up to 8 years of combined K12 (KL2) and K08 or K23 funding.

A New NIH R Grant to Promote Team Science and Physician Scientist Team Leaders

Current Challenges:

1. Changes in the American family with 2 careers more common
2. The growing need for team science
3. The increasing administrative burdens of writing and leading an R01
4. The need for training team leaders

One Potential Contribution to Addressing the New Challenges: A New R Grant to Promote Team Science and Physician investigator Team Leaders

Proposal: A new independent NIH R grant to encourage outstanding early phase physician scientists to participate in outstanding scientific teams as *independent investigators*, with the goal of developing team leadership skills.

A New NIH R Grant to Promote Team Science and Physician Scientist Team Leaders

Eligibility: Physician scientists successfully completing K08 or K23 awards.

Application: Describe how the applicant will contribute her or his *independent scientific expertise* to an existing NIH-funded team led by an outstanding leader. Describe how the leader will develop the applicant's team leadership skills.

Percent Effort: No less than 50%

Term: 5 years

Direct costs: Salary and $75 K for partial technical support, reagents, supplies, and travel.

NIH PSW Recommendations

- NIH should support pilot grant programs to test novel approaches to shorten research training for physician-scientists.

- NIH should maintain robust support for MD/PhD programs.

- NIH should expand the Loan Repayment Program and the amount of loan forgiven should be increased to more realistically reflect the debt burden of current trainees.

NIH PSW Recommendations

- **NIH should shift the balance in National Research Service Award (NRSA) postdoctoral training for physicians so that a greater proportion are supported through fellowships, rather than training grants.**

- **NIH should establish a new physician scientist-specific granting mechanism to facilitate the transition from training to independence.**

- **NIH should continue to address the wide gap in RPG application success between new and established investigators.**

NIH PSW Recommendations

- **NIH should leverage the existing resources of the Clinical and Translational Science Awards (CTSA) program to obtain maximum benefit for training and career development of early-career physician-scientists.**

- **NIH should intensify its efforts to increase diversity in the physician-scientist workforce.**

- **NIH should develop improved tools for tracking career development and progression.**

The Rockefeller University Graduate Tracking Survey System

Michelle Romanick, B.A.[1], Kwan Ng, B.S.[2], George Lee, B.S.[2], Matthew Herbert, B.S.[2], and Barry S. Coller, M.D.[3]

Clin Tansl Sci 2014

The CTSA educational programs are crucial components of the CTSA program.

To assess the impact of these programs and to improve them, it is crucial to track the careers and accomplishments of the graduates.

The number of trainees is already substantial, and will continue to increase over time.

GTSS Conception

Create a core set of questions that captures the most important aspects of graduates' careers and accomplishments.

Create a web-based electronic infrastructure to facilitate the collection, organization, analysis, and display of the data.

Pre-populate key data from public websites in standardized formats (grants, publications, clinical trials, patents).

GTSS: Philosophical Basis for Question Selection

The essential criterion to judge the success of a translational science training program is whether graduating trainees go on to improve human health and so many questions are designed to assess this directly.

Since there is expected to be a time lag between when a trainee completes a training program and when she or he improves human health, other questions are designed to assess "surrogate" indicators that may provide valuable interim measures of likely success.

GTSS: Advantages of the SMART Structure

Simplifies completion for graduates.

Insures uniform format.

Facilitates aggregation of data.

Provides “hidden data” that may be valuable in the future.

Rockefeller University Center for Clinical and Translational Science

Graduate Tracking Survey System (GTTS)

25 Institutional Adopters, excluding Rockefeller

- American Society of Hematology
- Case Western Reserve University Clinical and Translational Science Collaborative Center
- Cincinnati Children's Hospital Medical Center Pediatric Scientist Development Program
- Columbia
- Dartmouth
- Duke
- Mayo Foundation for Education and Research
- Medical College of Wisconsin
- Icahn School of Medicine at Mount Sinai
- Ohio State University Wexner Medical Center for Clinical and Translational Science
- Stanford University
- Temple University
- The Scripps Research Institute
- UC – Davis Health System Clinical and Translational Science Center
- UC – Irvine Institute for Clinical and Translational Science
- UC-Los Angeles
- UC – San Diego CTSA
- University of Chicago
- University of Minnesota Clinical and Translational Science Institute
- University of North Carolina
- University of Rochester
- University of Southern California Clinical and Translational Science Institute
- University of Texas Southwestern Medical Center
- University of Utah
- University of Washington Institute of Translational Health Services

Clinical Scholar Graduates Since 2006

- 35 Graduates: 20 Female and 15 Male
- 2 K23 (1 pending); 3 Female
- 5 K08 (1 pending); 2 Female
- 1 R21; Female
- 2 R01; 2 Female
- 1 U01; Female
- Total of 26 NIH and other grant support: $29,887,012

Clinical Scholar Graduates Since 2006

- 12 remain at Rockefeller
- 7 moved to academic positions in other countries
- 5 moved to research positions in industry: Merck (2), Amgen, Genentech, CLINiLABS
- 4 returned to training programs
- 3 took academic positions in other academic medical centers (Harvard, Mount Sinai, Northwestern)
- 1 is in San Francisco Department of Public Health
- 1 joined U.S.A.I.D.
- 1 is at NIH
- 1 is in clinical practice

Clinical Scholar Graduates 2001- 2006

- 26 Scholars: 13 Female and 14 Male
- 4 K23; 1 Female
- 1 K08; Female
- 5 R01 (1 pending)
- 1 UG1
- 1 M01
- 1 P30
- 1 K32; Female
- 1 R03
- Total of 55 NIH and other grants $36,404,825

Clinical Scholar Graduates 2001-2006

- 12 took academic positions in other academic medical centers
- 6 moved to academic or research positions in other countries
- 2 moved to research positions in industry (Astra Zeneca and Gilead)
- 5 went into clinical practice

Other Crucial Issues for Physician Investigators

Housing

Day Care

Debt and Loan Forgiveness