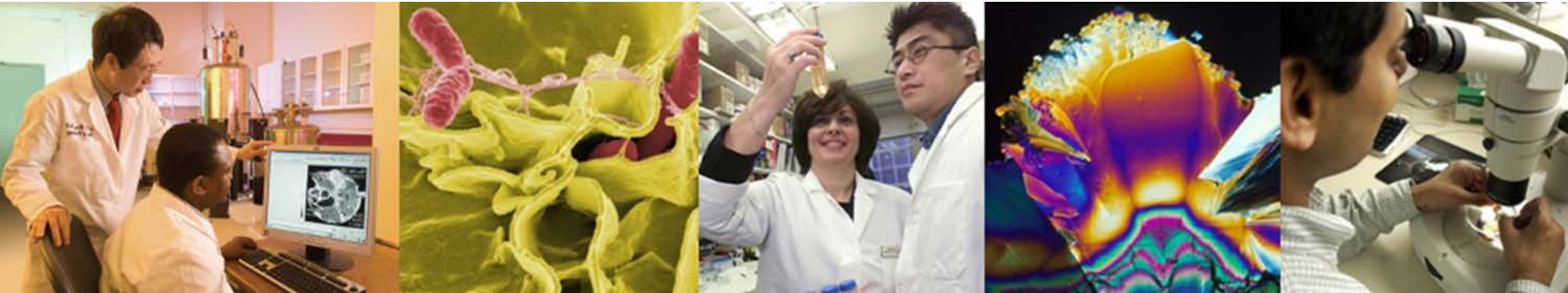# ACD High-Risk, High-Reward:
Working Group Update

ACD Meeting
June 14, 2018

Lawrence A. Tabak, DDS, PhD
Principal Deputy Director, NIH
Department of Health and Human Services

Brendan Lee, MD, PhD
Chairman and Professor, Department of Molecular and Human Genetics
Baylor College of Medicine

High-Risk, High-Reward – Unique Common Fund Programs

- Investigator-initiated scientific goals
- Enable investigators to launch a potentially transformative project on any topic without preliminary data
  - *Risk involved is mitigated by emphasizing past accomplishments during review and by allowing changes of course during the funding period*
- Individual awards are 5 years
- Piloting novel application and review processes
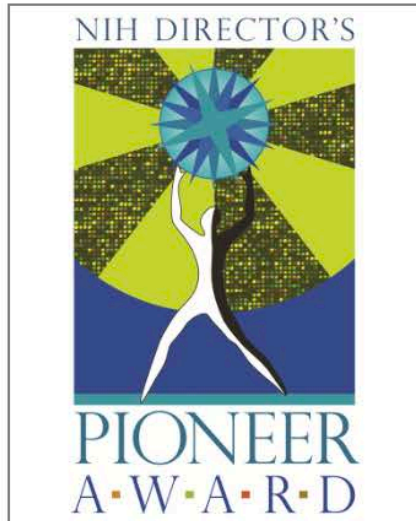
National Institutes of Health
Office of Strategic Coordination - The Common Fund

Slide Credit: Betsy Wilder

High-Risk, High-Reward – Unique Common Fund Programs

Funding opportunities for outstanding scientists at all career stages

The High-Risk, High-Reward Research program supports **exceptionally creative scientists** pursuing **highly innovative research with the potential for broad impact** in biomedical or behavioral science. The program's four constituent NIH Director's awards provide a diverse set of funding opportunities.

NIH DIRECTOR'S
PIONEER
A·W·A·R·D

NIH DIRECTOR'S
NEW INNOVATOR
AWARD

NIH DIRECTOR'S
TRANSFORMATIVE
RESEARCH
AWARD

NIH DIRECTOR'S
EARLY
INDEPENDENCE
AWARD

FY17 Pioneer Awards

Only 1 of the 12 Awardees is a woman

- *What factors contributed to this outcome?*
- *How can we promote gender diversity in this program?*
- *What about other HRHR programs?*

ACD working group assembled to explore these and related questions for HRHR programs

ACD High-Risk, High-Reward Working Group

Lawrence Tabak,
D.D.S., Ph.D. (Co-Chair)
Office of the Director, NIH

Molly Carnes, M.D.
University of Wisconsin

John Carpten, Ph.D.
Keck School of Medicine,
USC

Griffin Rodgers, M.D.
NIDDK

Amy Palin, Ph.D.
*Eunice Kennedy
Shriver* NICHD

Nicole Perry
Vanderbilt University

Brendan Lee, M.D.,
Ph.D. (Co-Chair)
Baylor College of Medicine

Sandra Schmid, Ph.D.
UT Southwestern Medical
Center

Scout, Ph.D.
The Torvus Group

Jason Sheltzer, Ph.D.
CSHL

Shirley Tilghman,
Ph.D.
Princeton University

Hannah Valantine, M.D.
OD Scientific Workforce
Diversity, NIH

Charge to the Working Group

- Review effectiveness of NIH HRHR research programs

- Analyze participation of women and other underrepresented groups in the applicant, finalist, and awardee pools of HRHR grants to identify possible causes for their underrepresentation

- Examine institutional diversity and diversity of scientific topics in the applicant and awardee pools

- Propose steps that NIH might take to enhance the diversity of applicants and awardees in HRHR programs, while supporting the best science

Review effectiveness of NIH HRHR research programs

All 4 Common Fund HRHR programs will be evaluated

- Pioneer Award, New Innovator, Early Independence, Transformative Research Award (has lowest percent women among awardees)
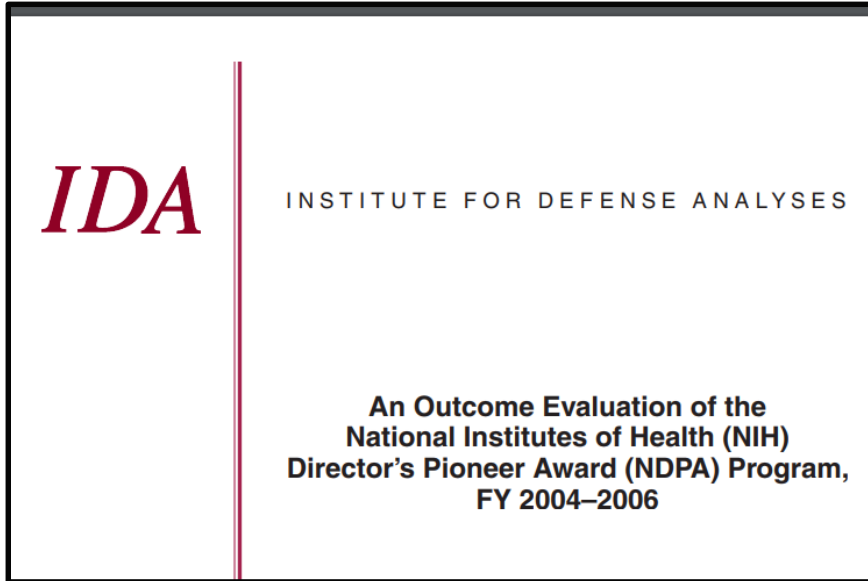
Metrics for evaluation of success of HRHR awards:

- Productivity (in proportion to resources)
  - RCR data (bibliometric analysis), patents and licenses
- Impact
  - Translation to clinic, network analyses of topics, appearance of new terms in papers published by HRHR awardees
  - Number of editorial or perspectives pieces written on papers published by HRHR grantees

For Early Independence Awards "success" may include:

- Awardees career position; ability to obtain and maintain tenure-track position
- Securing additional (R01-level) NIH funding
- Compare recipients to finalists and Early Stage Investigators

Review effectiveness of NIH HRHR research programs

IDA INSTITUTE FOR DEFENSE ANALYSES

An Outcome Evaluation of the
National Institutes of Health (NIH)
Director's Pioneer Award (NDPA) Program,
FY 2004–2006

- Compared research outcomes of the 33 Pioneers in first 3 cohorts to similarly qualified R01 investigators, random R01 sets, and HHMI investigators

- Assessed scientific impact and innovation through bibliometrics and expert analysis

- Found Pioneer-funded research is
  - More impactful than similar and random R01s and about as impactful as HHMI
  - More innovative than similarly qualified R01 investigators' research and similar to HHMI

Review effectiveness of NIH HRHR research programs

New Innovator Award Outcomes Evaluation Report by the Science & Technology Policy Institute

Table 1. Comparison of bibliometric indicators

Bibliometric indicator	NI Awardees compared with ESI R01 Awardees
Average Citations per Publication	NI awardees > ESI R01
IPP (Journal impact factor)	NI awardees > ESI R01
RCR (Relative Citation Ratio)	NI awardees > ESI R01
SNIP (Journal Source-Normalized Impact per Paper)	NI awardees > ESI R01
SJR (SciImago Journal Rank)	NI awardees > ESI R01
H - Index	No statistically significant difference
Number of publications	ESI R01 awardees > NI awardees
Average annual publications	ESI R01 awardees > NI awardees
Time to first publication (Faster is greater)	ESI R01 awardees > NI awardees

Evaluated outcomes of NI awardees in first 3 cohorts

- NI-funded research is more innovative, risky, and impactful than ESI R01 research

- Awards did not have significantly more positive or negative impact on the careers of its awardees than did ESI R01s (risk of research project did not put careers at risk)

Analyze participation of women and other underrepresented groups … to identify possible causes for their underrepresentation

Fewer women apply for HRHR awards compared to traditional R01s… Why?

Is additional bias introduced during review processes?

Analyze participation of women and other underrepresented groups … to identify possible causes for their underrepresentation

- Fewer women applying to HRHR program awards – Why?
  - Analyze FOA language
  - Analyze outreach efforts

Gender

Grant/Program and Cohort year	Cohort Year	Applicants					Finalists					Awardees				
		Male	Female	Withheld/ Unknown	Total	% Female	Male	Female	Withheld/ Unknown	Total	% Female	Male	Female	Withheld/ Unknown	Total	% Female
Pioneer Award, 2004-2017	TOTAL	3257	987	61	4305	23%	231	73	5	309	24%	130	50	0	180	28%
New Innovator, 2007 - 2017	TOTAL	5126	2293	161	7580	31%	734	290	15	1039	28%	323	174	5	502	35%
Transformative Research, 2009-2017	TOTAL	4304	1127	179	5610	21%	661	150	17	828	18%	181	40	4	225	18%
Early Independence Award, 2011-2017	TOTAL	305	207	77	589	40%	115	55	18	188	32%	73	25	1	99	26%

Analyze participation of women and other underrepresented groups … to identify possible causes for their underrepresentation

Strategies to encourage women and URM to apply for HRHR grants:

- Mentoring programs
- Publicize Early Independence Awards with training/career offices, like K awards

Analyze participation of women and other underrepresented groups … to identify possible causes for their underrepresentation

- Are numbers reduced as review process proceeds?
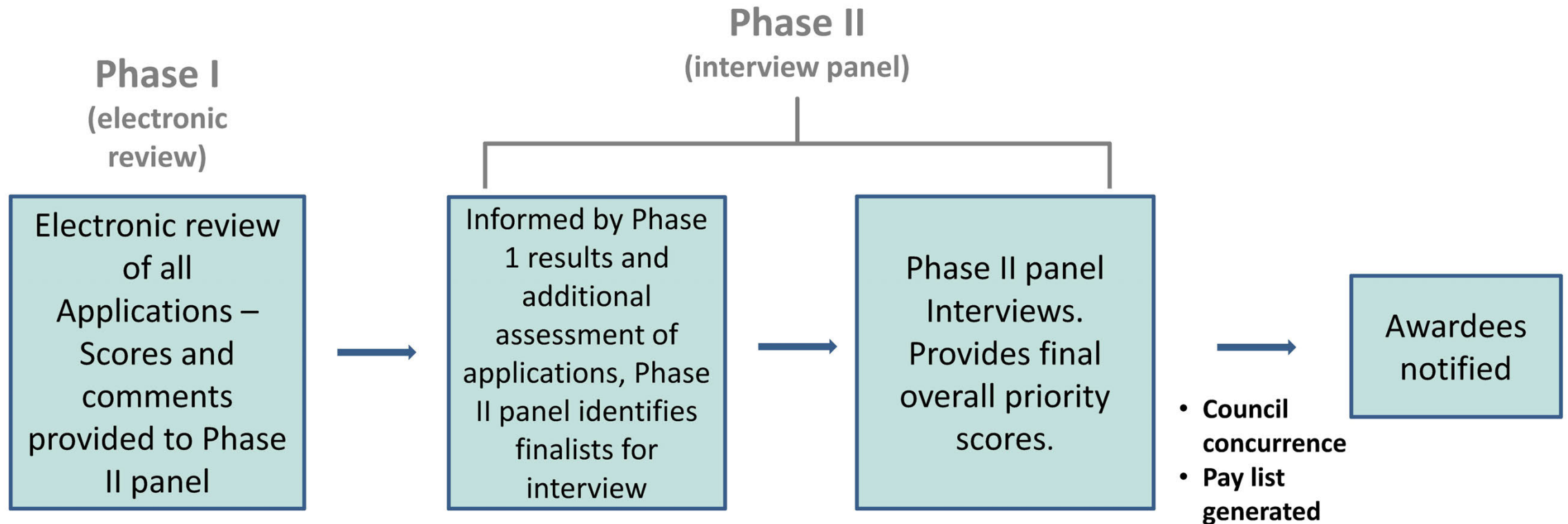 - Group is considering gender, ethnicity, and URM data

Gender

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Analyze participation of women and other underrepresented groups … to identify possible causes for their underrepresentation

- Evaluate male and female applicants. Are the starting applicant pools equivalent (look at number and evaluation metrics)?
  - Metrics: Funding received (R grants; NSF, F awards and T32 support for Early Independence; private/foundation awards)
- Aggregate analyses of letters of recommendation using text mining
  - Make comparisons between language used for letters for men, women, URM, awardees, and non-awardees

Pioneer Award Review Process

Phase I
(electronic review)

Phase II
(interview panel)

| Electronic review of all Applications – Scores and comments provided to Phase II panel | → | Informed by Phase 1 results and additional assessment of applications, Phase II panel identifies finalists for interview | → | Phase II panel Interviews. Provides final overall priority scores. | → | Awardees notified |

- Council concurrence
- Pay list generated

- Early Independence Award review process looks similar
- Pioneer Award, Early Independence Award, New Innovator Award ask for letters of recommendation

Slide Credit: Betsy Wilder

Analyze participation of women and other underrepresented groups … to identify possible causes for their underrepresentation

- Evaluate review processes for the Common Fund HRHR programs
  - Also look at National Institute of Arthritis and Musculoskeletal and Skin Disease X02 applications, which are anonymized for review
- Metrics for reviewer analyses
  - Reviewer gender, race/ethnicity, institutions, field of research
  - Reviewer expertise related to topics of the research proposals
- What might an ideal review panel look like for various stages of review?

Examine institutional diversity and diversity of scientific topics in the applicant and awardee pools

- **Institutions** of applicants and awardees
  - Why do certain institutions have higher frequencies of applicants and awardees?

- FY17 Pioneer Awards: 12 awards total
  - Broad Institute
  - Harvard (3)
  - Harvard Medical School
  - MIT
  - Rockefeller University
  - Stanford (3)
  - University of Miami School of Medicine
  - Weill Medical College of Cornell University

- Analyze all awards, all years

Examine institutional diversity and diversity of scientific topics in the applicant and awardee pools

- **Scientific topic areas** of applicants and awardees
  - Are there under- or over-represented topics among HRHR awards?
  - Are topics that require heavy collaboration represented in HRHR programs?
    - Examples include population studies, epidemiology, studies looking at health outcomes

- Types of awards: Person-based versus team-based projects
  - Include team-based HRHR awards, or build into the applications the option to link to or describe a team
  - Place topics of interest that are underrepresented in funding announcements as topics of interest

Other Considerations

- What strategies can inspire innovation in NIH HRHR programs?

- What are characteristics of an ideal high-risk funding announcement?

- How (when) can one assess conceptual vs technical innovation?

- Are there lessons we can take from other organizations such as DARPA and HHMI to apply to high-risk awards at NIH?
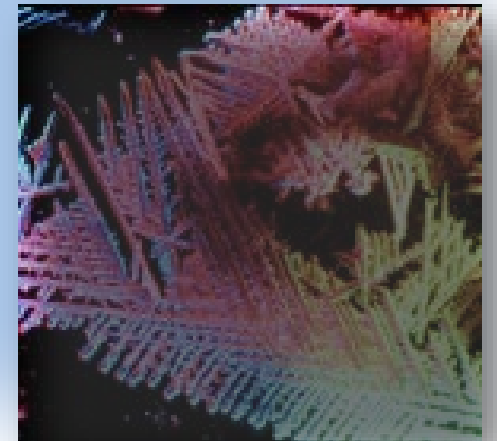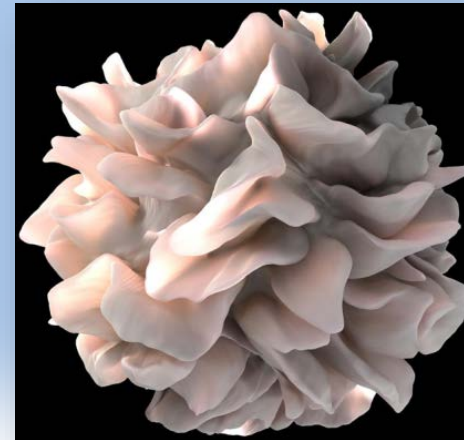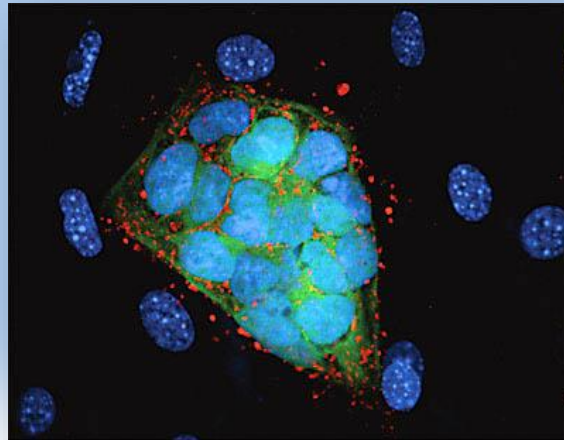
Timeline

- After evaluating and analyzing the HRHR programs, propose steps that NIH might take to enhance the diversity of applicants and awardees in these programs, while supporting the best science
  - Initial recommendations: December 2018 ACD meeting
  - Final recommendations: June 2019 ACD meeting

NIH...
Turning Discovery Into Health

Lawrence.Tabak@nih.gov

Top 19 applicant institutions for Pioneer Award in years 2013 - 2017

Institution	# apps	% apps
STANFORD UNIVERSITY	78	7.5
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO	45	4.3
UNIVERSITY OF CALIFORNIA SAN DIEGO	35	3.4
UNIVERSITY OF CALIFORNIA LOS ANGELES	32	3.1
JOHNS HOPKINS UNIVERSITY	32	3.1
UNIVERSITY OF PENNSYLVANIA	23	2.2
COLUMBIA UNIVERSITY HEALTH SCIENCES	22	2.1
MASSACHUSETTS GENERAL HOSPITAL	22	2.1
YALE UNIVERSITY	21	2.0
UNIVERSITY OF MICHIGAN	20	1.9
HARVARD UNIVERSITY	20	1.9
BRIGHAM AND WOMEN'S HOSPITAL	19	1.8
MASSACHUSETTS INSTITUTE OF TECHNOLOGY	17	1.6
ROCKEFELLER UNIVERSITY	15	1.4
UT SOUTHWESTERN MEDICAL CENTER	13	1.2
HARVARD MEDICAL SCHOOL	13	1.2
UNIVERSITY OF MINNESOTA	13	1.2
PRINCETON UNIVERSITY	12	1.1
UNIVERSITY OF WASHINGTON	12	1.1
Total	464	44.4