Long-term Effects from Early Exposure to Research: Evidence from the NIH “Yellow Berets”

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Disclaimer

This presentation was prepared for the 2018 ADRF Conference in Washington, DC.

It was developed to promote research and advancements in our understanding of the use of administrative records in household and person-level statistics. In that spirit and to encourage discussion and thoughtful feedback at early stages of our work, this presentation has undergone a more limited review than official Census Bureau reports. All views and any errors are solely those of the author and do not necessarily reflect any official position of the Bureau.

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Chart of Doom #1: Rising Research Effort, Flat Productivity

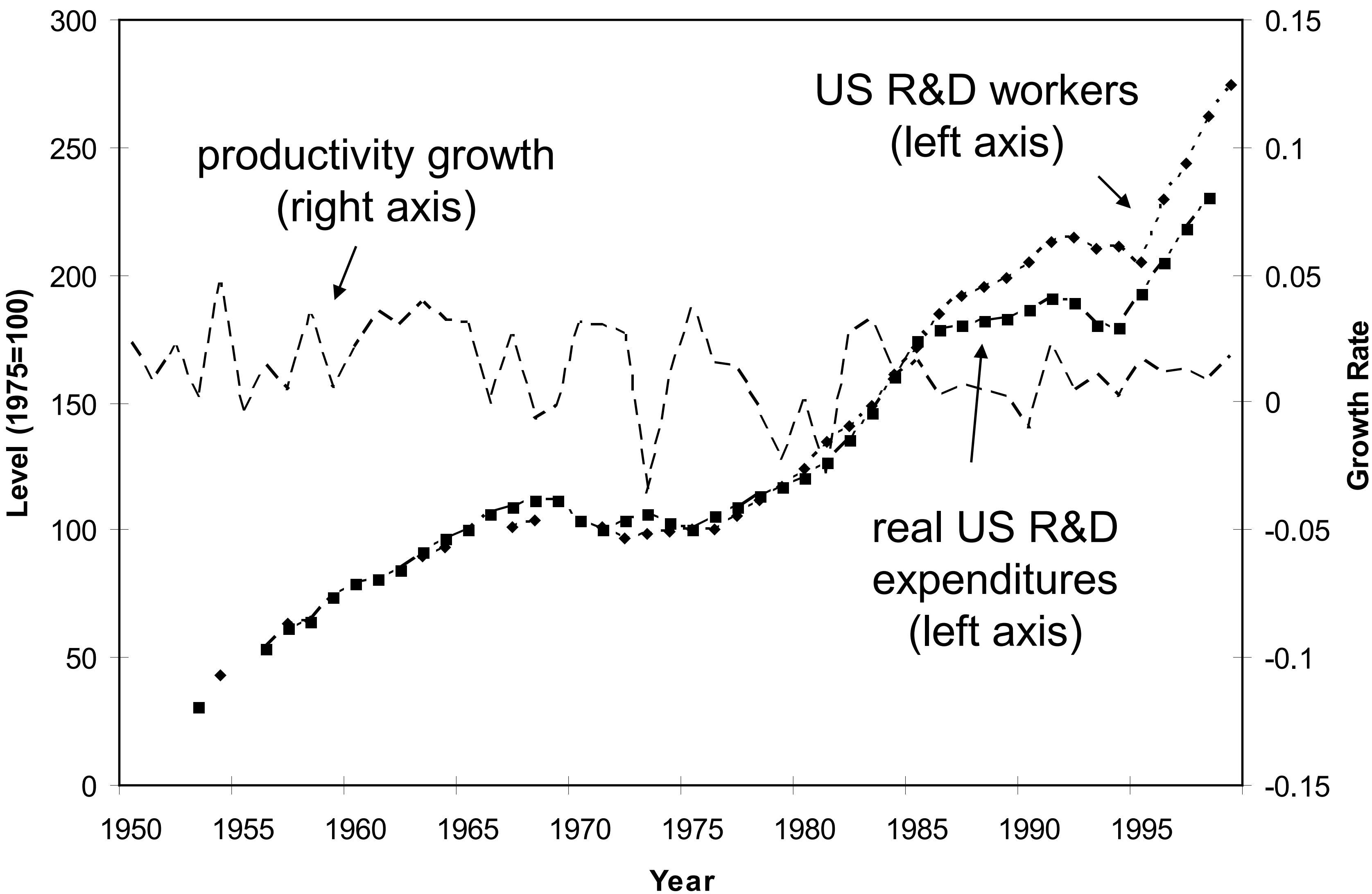
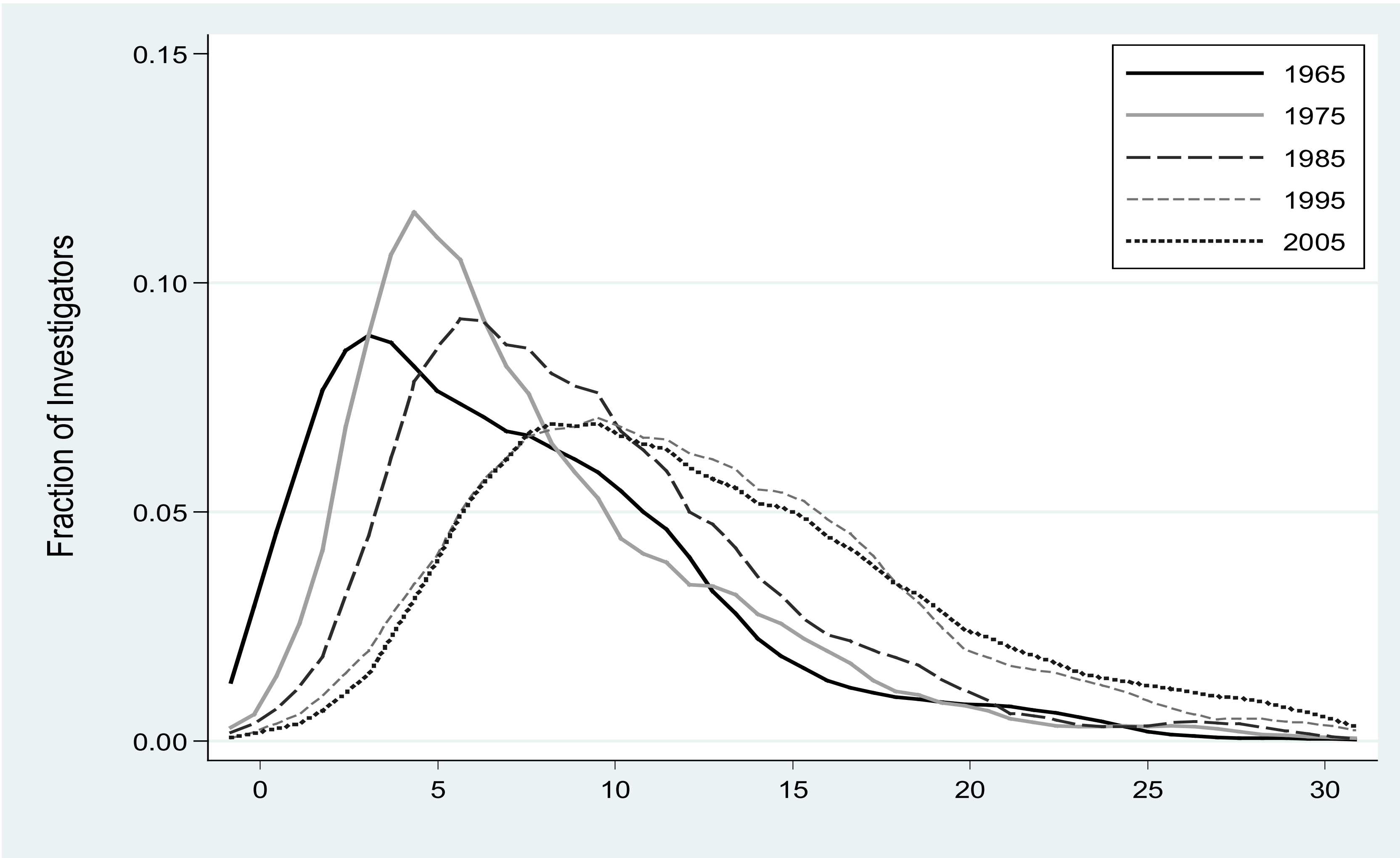


Chart of Doom #2: The Graying of the Scientific Workforce



The question

- ***Early careers in general, and early scientific careers in particular can be fragile (Oreopoulos et al. 2006, Hill 2018)***

- ***But fragility might go hand in hand with malleability (Higgins 2005)***

- ***Can one induce young people to become innovators?***

The supply of innovators: a brief review

- ***"Innovating in Science and Engineering or 'Cashing in' on Wall Street? Evidence on Elite STEM Talent" (Shu 2016)***
  - *The marginal financier (i.e., MIT grad who pursued engineering rather than finance in the doldrums of the great recession) has a relatively low grades in STEM classes.*

- ***Recent paper by Graff Zivin and Lyons (2018)***
  - *No evidence of crowd out in a student innovation contest*

- ***Evidence from US inventors: exposure effects in childhood have long run impacts on the probability to patent (Bell et al. 2016)***

- ***Hill (2018) documents the fragility of early careers in astronomy using weather shocks to seeing conditions***

The notional experiment

- ***Find a population of “naïve to research” individuals who nonetheless possess much of the human capital required to propel themselves to the research frontier***

- ***Provide to a (random?) subset of them a short but intense exposure to research in a rarefied intellectual environment***

- ***Wait 50 years to gauge the full effects of this short-term intervention***

A serendipitous find…

The NIH Associate Training Programs

- ***"Doctor Draft" initiated during the Korean War***

- ***Started in 1953 with a few dozen medical graduates***
  - *Two years in the US PHS Commissioned Corps*
  - *PHS CC also include CDC and IHS*

- ***Escalated during the Vietnam War***
  - *1967: restrictions on exemptions available to physicians seeking deferment*
  - *Leads to increased selectivity of the program*
  - *But even in 1963, 53 of 1,464 physician applicants were selected (NIH Office of Research Information 1963)*

- ***Three sub-programs: RA, CA, SA***

Program content and objectives

- ***Turn physicians into independent medical investigators well grounded in modern scientific knowledge and methods. Associates should:***
  - *learn how to do research more than to do research itself*
  - *be brought into close contact with accomplished scientists in specialized research fields*

> *"The importance of having the Research Associate[s] work on problems of [their] own choice rather than be 'servants' in the research problems of the preceptor, and the importance of providing the student[s] with some integrated and organized basic knowledge as a foundation that would permit them to do their own integrating of knowledge later."*
>
> *—Christian Anfinsen (1963)*

- ***By 1970, the NIH ATP was recognized as the place to get thorough training in biomedical research in the US (Broder 2001)***

Existing evidence

- ***Khot et al. 2011 compares ATP attendees with a control sample of non-ATP medical school academics***

- ***Klein (1998) provides an historical analysis of the Yellow Berets' "legacy"***

- ***None of these writings leverage data on the unsuccessful applicants, whose index cards were thought to have been destroyed***

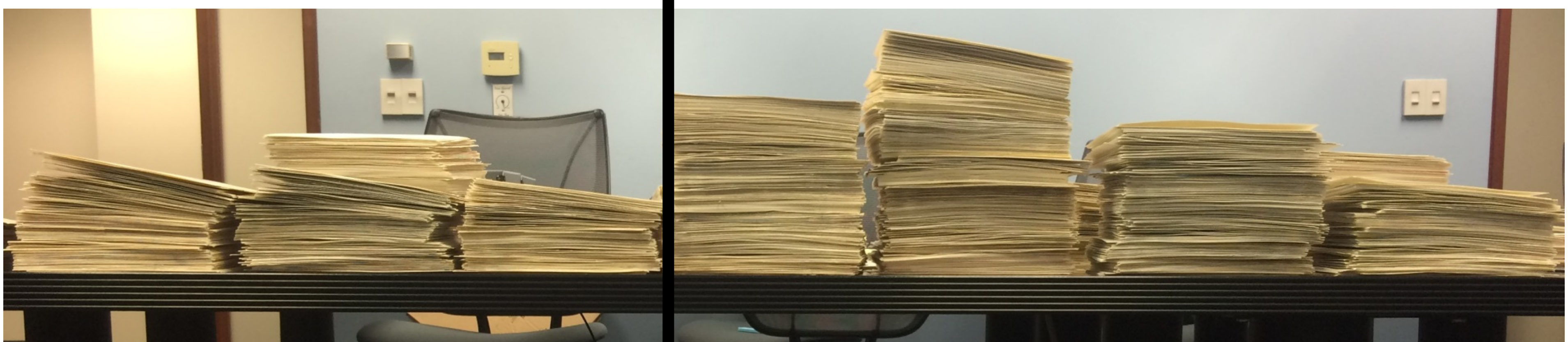
Pros and cons of using Medicine/NIH ATP as a setting

- ***MDs acquire a lot of human capital over the course of their training, but face the choice of deploying it across two different settings:***
  - *The production (aka clinical) setting, where their HC generates mostly private returns*
  - *The research setting, where the same HC also generates social returns*
  - *Long-standing goal of the medical elite: steer a larger number of physicians towards research careers (Wyngaarden 1979; Rosenberg 1999)*

- ***Key limitation***
  - *external validity: NIH is a pretty unique place, and it became unique in large part because the alternative was Vietnam*

The (very) raw data…

Vietnam War Lottery Draft Years



1967 1968 1969 | 1970 1971 1972 1973

NAME FAUCI, ANTHONY STEPHEN *NIAID* *1968* DATE 4/19/66

P. ADDRESS 300 Broadway, Dobbs Ferry, New York

M. ADDRESS ~~436~~ 445 E. 69th Street, New York, N. Y. 10021

DOB	CITIZENSHIP	APPLIED FOR	APPLIED TO
12/24/40	U. S.	CA	NCI, NHI, NIAID, NIAMD, OIR

SCHOOL M. D. '66 Cornell University Medical College

INTERNSHIP 66-67 (Medicine) The New York Hospital

RESIDENCY *67-68* " "

INTEREST Academic medicine with teaching and research

EXPERIENCE SOUGHT AT NIH Opportunity for increasing experience in laboratory investigation of clinical problems.

HONOR SOCIETIES Alpha Omega Alpha

ACTIONS			
	L.I.	APP. SENT	CO. ST. OP. *4/19/66*
	REJ.	APP'T.	CORD APP:

O.P. ACTION *NIAID – LCI – CA*

NIH-106-6
Rev. 3-65

NIH ASSOCIATE INFORMATION AND STATUS RECORD

NAME VARMUS, Harold Eliot *NIAMD – Pastan 1968* *CA* DATE 3/25/66

P. ADDRESS 205 Moore Ave., Freeport, N.Y. *over over*

M. ADDRESS ~~Clara Swain Mission Hosp., Bareilly, U.P., India (until 6/1)~~

DOB	CITIZENSHIP	APPLIED FOR	APPLIED TO
12/18/39	US	CA-RA	NCI, NHI, NIAID, NIAMD, OIR ~~SEE FILE FOR CURRENT ADDRESS!!~~

SCHOOL M.D., '66, Columbia Univ. Col. of Phys. & Surg., NY

INTERNSHIP '66-67, Med., Presbyterian Hosp., NY

RESIDENCY *67-68* " "

INTEREST Academic Med. with as yet undetermined distribution of time among teaching, research & clin. work. No interest in private practice. Hope to find a research field that will alow me to work abroad for periods of time.

EXPERIENCE SOUGHT AT NIH My first truly sustained attempt at research, allowing me to assess more realistically how much time I shall want over

HONOR SOCIETIES Phi Beta Kappa; AΩA

ACTIONS			
	L.I.	APP. SENT	CO. ST. OP. *3/25/66*
	REJ.	APP'T.	CORD APP:

O.P. ACTION

NIH-106-6
Rev. 3-65

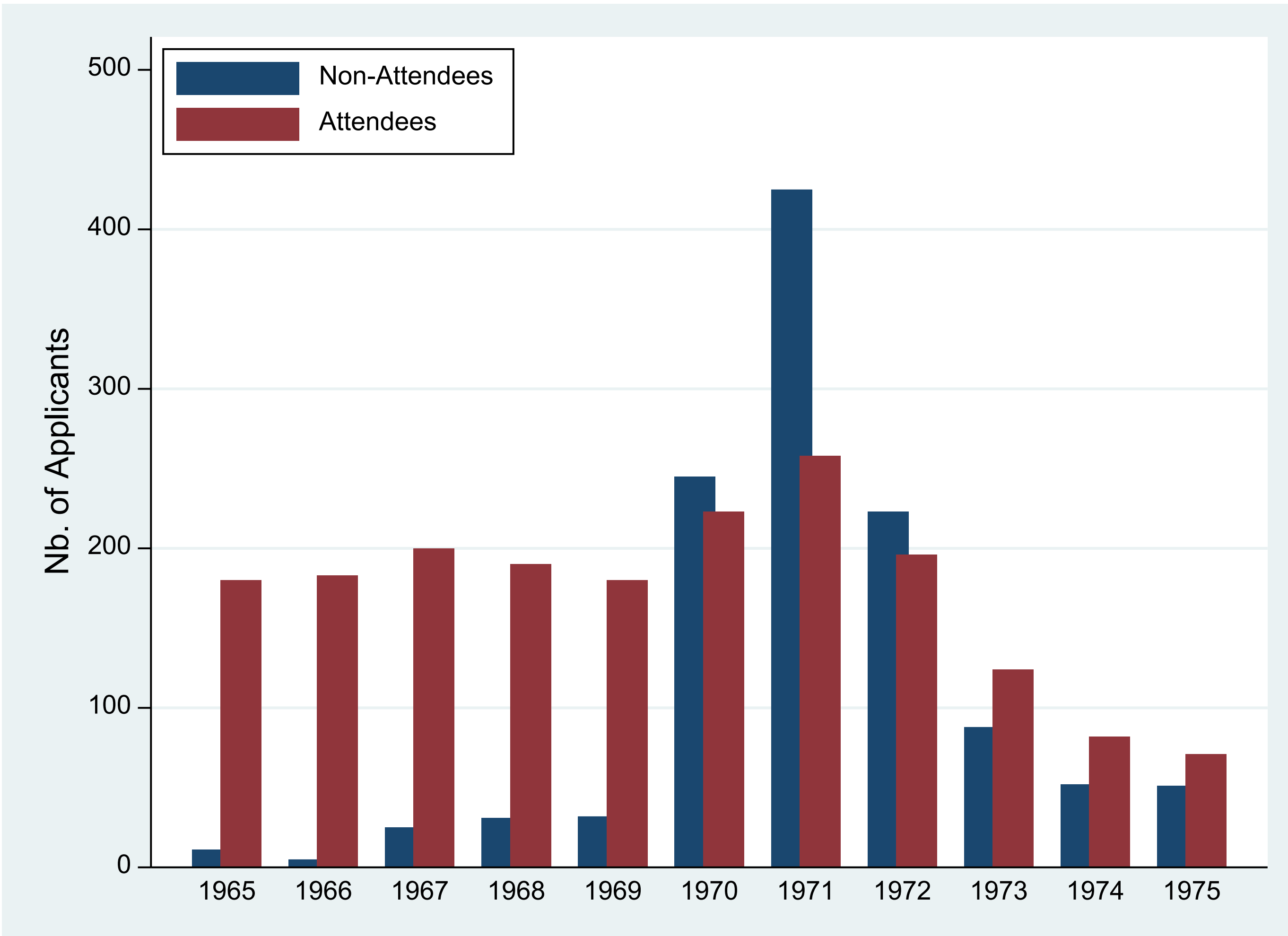
NIH ASSOCIATE INFORMATION AND STATUS RECORD

ultimately to devote to it; an opportunity to learn to use research tools; a chance to become more deeply involved in any one of several areas of interest than has been possible at school, so that I may, for the first time, begin to formulate concrete experimental plans of my own.

96 Haven Ave.
Apt. 45
Presbyterian Hosp.

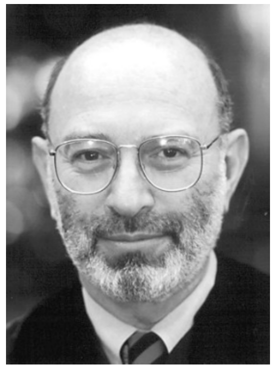
N=3,075 Second Round Applicants

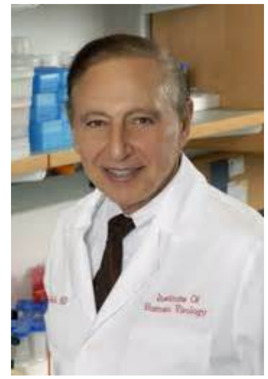
1,887 (61.37%) Attendees; 1,188 (38.63%) Non-attendees



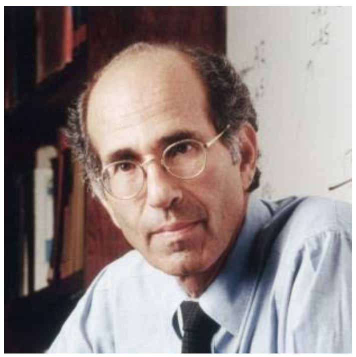
7 Nobel Prize Winners, 32 HHMIs, 88 Members of the National Academies…

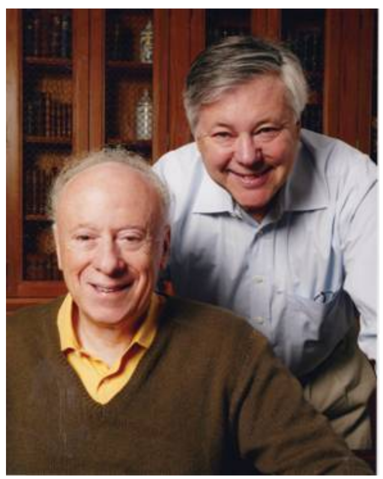

Anthony Fauci, 1968


Stanley N. Cohen, 1962


Robert C. Gallo, 1965


Edward M. Scolnick, 1967


Richard Axel, 1972


Michael S. Brown &
Joseph L. Goldstein, 1968


Phil Leder, 1962


Vincent T. DeVita, Jr., 1963


Harold Varmus, 1968

Data sources

- ***NIH ATP index cards***
- ***NIH Compound Grant Applicant File***
- ***NIH telephone directories***
- ***AAMC Faculty Roster***
- ***AMA Physician Master File***
- ***USPTO patent data***
- ***PubMed/WoS***
- ***Google, doximity, etc.***

Descriptive Statistics: Pre-Application Data

	Mean	Median	Std. Dev.	Min.	Max.
Non-Attendees					
PhD	0.013	0	0.115	0	1
Age	25.934	26	1.419	22	39
Nb. of Applications	1.027	1	0.167	1	3
Last Application Year	1971.140	1971	1.695	1965	1975
Application Lag	1.037	1	0.634	0	5
Draft Lottery Number	188.358	192	108.681	1	366
Draft Lottery Number Called	0.508	1	0.500	0	1
Number of Institutes Applied For	2.992	3	1.985	1	11
AΩA Honor Medical Society	0.258	0	0.438	0	1
Pre-ATP Nb. of Publications	0.605	0	1.301	0	13
Pre-ATP JIF-weighted Nb. of Publications	3.412	0	10.332	0	100
NIH Grants for Applicant's Medical School	$ 173,784,646	$ 148,395,168	$ 131,547,895	$ 2,234,396	$ 600,193,216
Attendees					
PhD	0.036	0	0.185	0	1
Age	26.016	26	1.433	21	35
Nb. of Applications	1.029	1	0.171	1	3
Last Application Year	1969.424	1970	2.800	1965	1975
Application Lag	1.019	1	0.612	0	5
Draft Lottery Number	182.948	186	105.638	1	366
Draft Lottery Number Called	0.524	1	0.500	0	1
Number of Institutes Applied For	3.926	4	2.227	1	11
AΩA Honor Medical Society	0.385	0	0.487	0	1
Pre-ATP Nb. of Publications	1.030	0	1.739	0	14
Pre-ATP JIF-weighted Nb. of Publications	6.775	0	14.736	0	154
NIH Grants for Applicant's Medical School	$ 206,288,948	$ 169,132,320	$ 150,539,600	0	$ 640,648,192

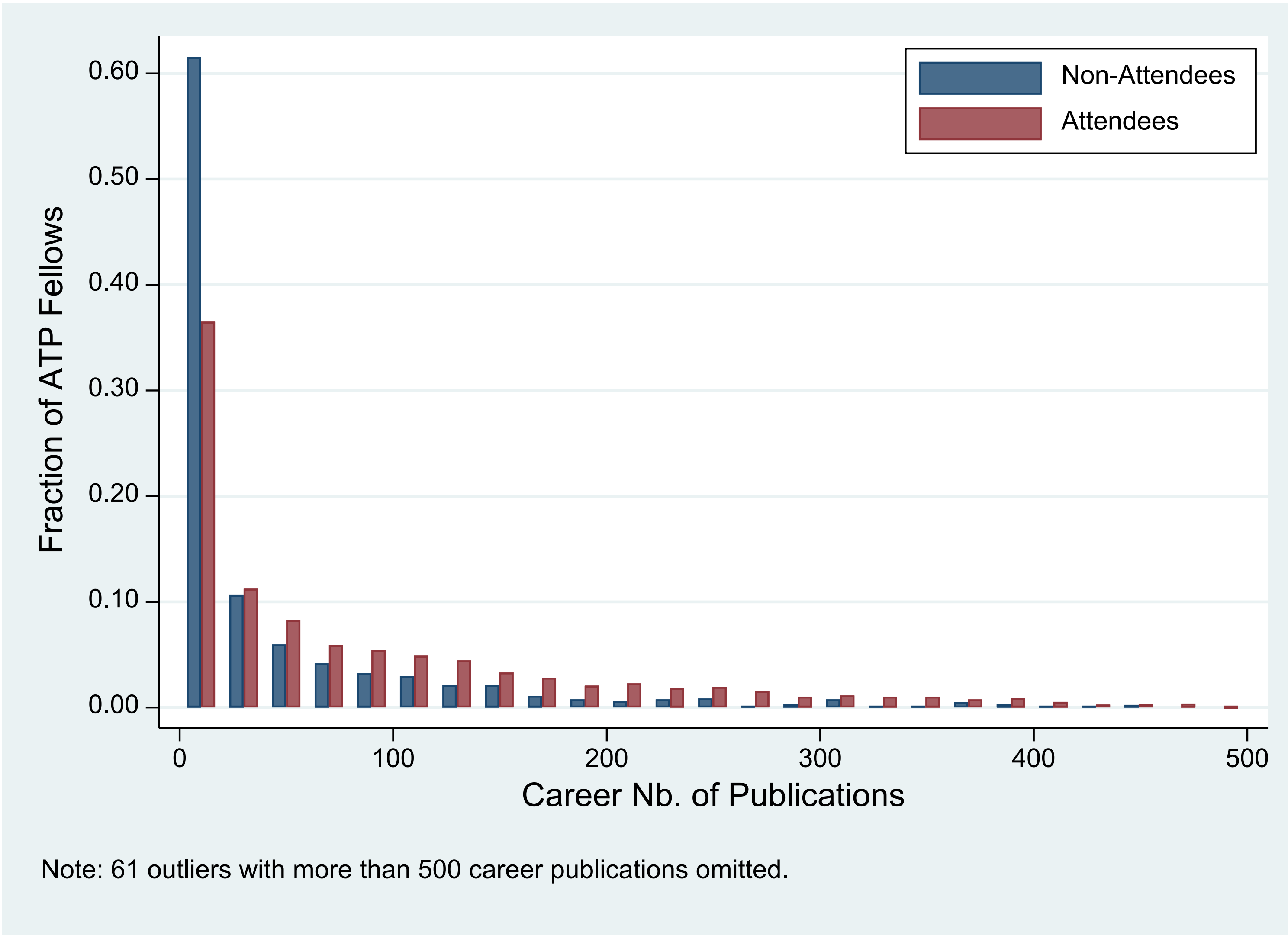
Descriptive Statistics: Career Choice

	Mean	Median	Std. Dev.	Min.	Max.
Non-Attendees					
Deceased	0.073	0	0.261	0	1
Nb. of Career Years	37.711	39	5.843	0	50
First Job in Academia	0.572	1	0.495	0	1
Ends Career in Academia	0.380	0	0.486	0	1
Researcher First Job	0.465	0	0.499	0	1
Ends Career as Researcher	0.304	0	0.460	0	1
First Job in Clinical Practice	0.525	1	0.500	0	1
Ends Career in Clinical Practice	0.652	1	0.477	0	1
Attendees					
Deceased	0.101	0	0.301	0	1
Nb. of Career Years	38.122	39	6.379	0	50
First Job in Academia	0.761	1	0.427	0	1
Ends Career in Academia	0.551	1	0.498	0	1
Researcher First Job	0.696	1	0.460	0	1
Ends Career as Researcher	0.522	1	0.500	0	1
First Job in Clinical Practice	0.297	0	0.457	0	1
Ends Career in Clinical Practice	0.439	0	0.496	0	1

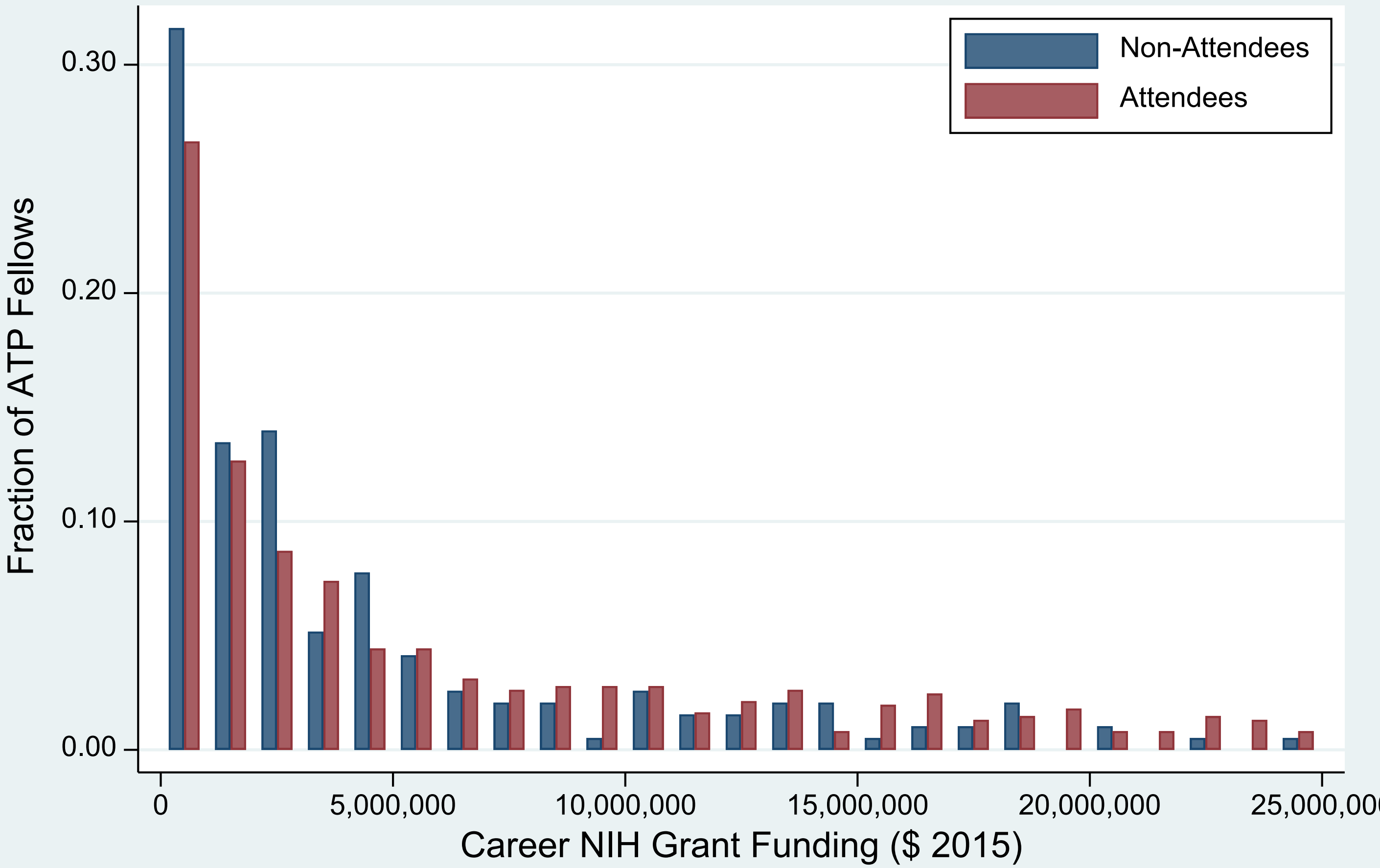
Descriptive Statistics: Research Outcomes

	Mean	Median	Std. Dev.	Min.	Max.
Non-Attendees					
Career Nb. of Pubs	50.691	9	102.816	0	929
Career Nb. of Pubs, 1st/last Authorship Pos.	28.667	6	56.755	0	491
Career citations	2604.219	240	6987.277	0	90,939
Nb. of Patents	0.673	0	3.749	0	51
At least one patent	0.113	0	0.316	0	1
Nb. of Citations to Pubs. in Patents	26.938	0	98.090	0	1,370
Nb. of Citations to Patents. in Patents	8.089	0	56.615	0	1,159
Career h-index	14.384	5	20.933	0	159
Howard Hughes Medical Investigator	0.000	0	0.000	0	0
Member of the NAS/NAM	0.013	0	0.112	0	1
Nobel Prize Recipient	0.000	0	0.000	0	0
NIH MERIT (R37) Awardee	0.012	0	0.108	0	1
Years of Post-graduate Training	5.877	6	1.683	1	13
Nb. of Pubs, Training Period	2.686	1	4.435	0	42
Nb. of Citations, Training Period	121.442	11	278.325	0	2,349
Recipient of a NIH Extramural Fellowship	0.073	0	0.261	0	1
NIH Grant Recipient	0.201	0	0.401	0	1
Career NIH Grants ($ 2015)	$ 4,110,152	0	$ 28,912,105	0	$ 801,567,296
NIH R01 Grant Recipient	0.146	0	0.354	0	1
Career NIH R01 Grants ($ 2015)	$ 1,138,759	0	$ 4,814,575	0	$ 74,067,040
Attendees					
Career Nb. of Pubs	102.428	47	137.583	0	1,101
Career Nb. of Pubs, 1st/last Authorship Pos.	60.162	27	83.495	0	731
Career citations	6543.023	1728	12971.034	0	223,420
Nb. of Patents	1.753	0	6.611	0	163
At least one patent	0.241	0	0.428	0	1
Nb. of Citations to Pubs. in Patents	88.216	8	261.864	0	4,394
Nb. of Citations to Patents. in Patents	20.143	0	106.016	0	2,409
Career h-index	28.040	18	28.635	0	198
Howard Hughes Medical Investigator	0.017	0	0.129	0	1
Member of the NAS/NAM	0.047	0	0.211	0	1
Nobel Prize Recipient	0.004	0	0.061	0	1
NIH MERIT (R37) Awardee	0.042	0	0.200	0	1
Years of Post-graduate Training	6.429	6	1.557	1	15
Nb. of Pubs, Training Period	6.344	5	6.773	0	67
Nb. of Citations, Training Period	395.684	186	618.712	0	8,325
Recipient of a NIH Extramural Fellowship	0.096	0	0.295	0	1
NIH Grant Recipient	0.441	0	0.497	0	1
Career NIH Grants ($ 2015)	$ 11,429,705	0	$ 36,107,622	0	$ 761,801,088
NIH R01 Grant Recipient	0.323	0	0.468	0	1
Career NIH R01 Grants ($ 2015)	$ 3,101,892	0	$ 7,954,544	0	$ 97,813,216

Career Publications

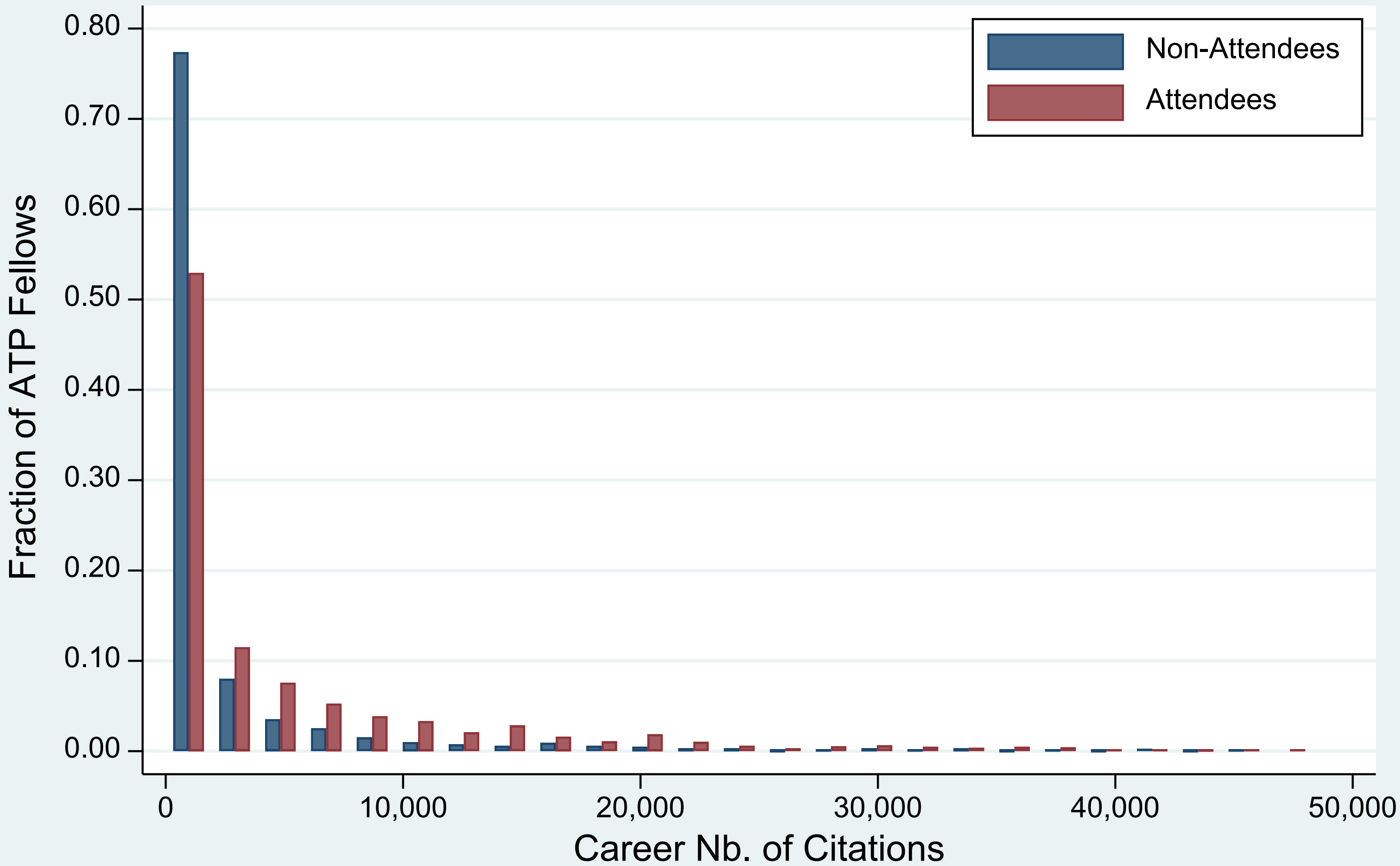


Career NIH Funding



Note: 1071 fellows receive at least some NIH funding during their career. 270 outliers with more than $25 mln. in career funding omitted.

Career Citations



Note: 32 outliers with more than 50,000 career citations omitted.

Applicants' Medical Schools

Medical School	Non-Attendees	Attendees	Total
Harvard Medical School	96 (8.08%)	264 (13.99%)	360 (11.71%)
Johns Hopkins University School of Medicine	59 (4.97%)	108 (5.72%)	167 (5.43%)
Columbia University College of Physicians & Surgeons	57 (4.80%)	85 (4.50%)	142 (4.62%)
University of Pennsylvania School of Medicine	55 (4.63%)	85 (4.50%)	140 (4.55%)
New York University School of Medicine	47 (3.96%)	82 (4.35%)	129 (4.20%)
Yale University School of Medicine	56 (4.71%)	73 (3.87%)	129 (4.20%)
Albert Einstein College of Medicine of Yeshiva University	52 (4.38%)	63 (3.34%)	115 (3.74%)
Duke University School of Medicine	24 (2.02%)	73 (3.87%)	97 (3.15%)
SUNY Downstate Medical Center College of Medicine	38 (3.20%)	51 (2.70%)	89 (2.89%)
Cornell University Medical College	32 (2.69%)	50 (2.65%)	82 (2.67%)
Total	516 (43.44%)	934 (49.49%)	1,450 (47.16%)

Distribution of First & Last Positions

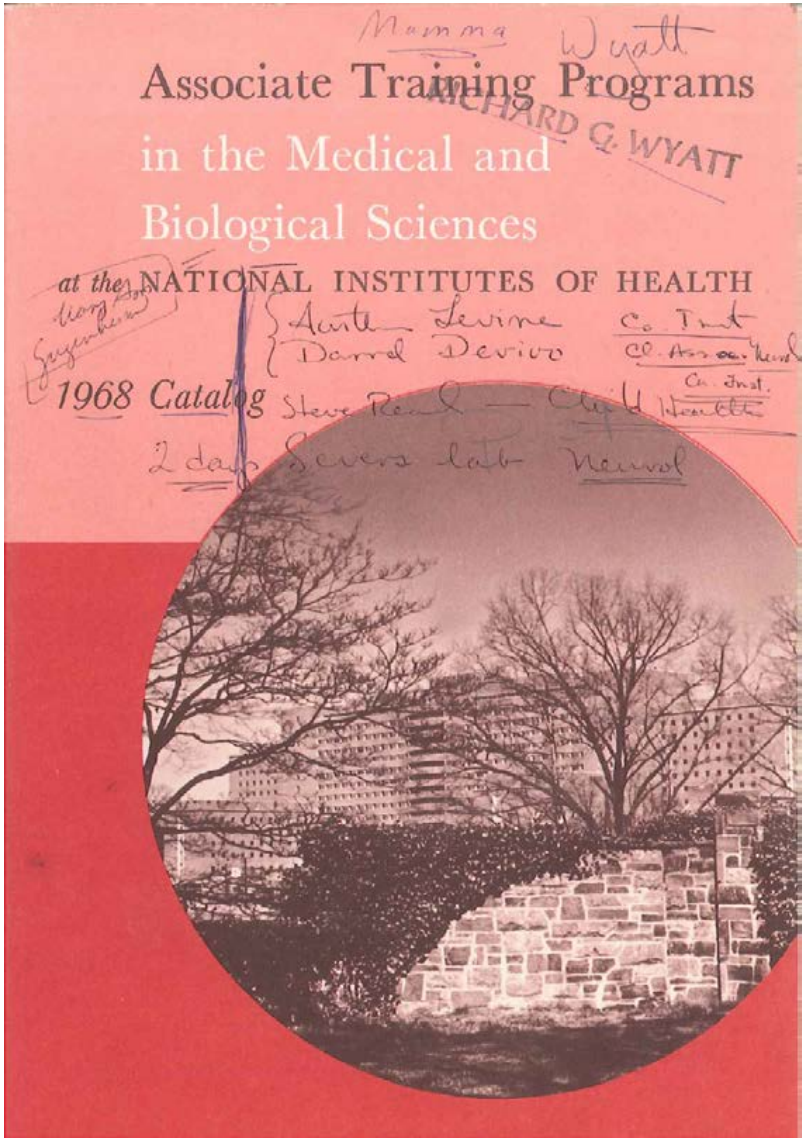
First Position	Non-Attendees	Attendees	Total
Academic Researcher	527 (44.36%)	1,152 (61.05%)	1,679 (54.60%)
Academic Clinician	130 (10.94%)	131 (6.94%)	261 (8.49%)
NIH Staff Scientist	23 (1.94%)	153 (8.11%)	176 (5.72%)
Solo Clinical Practice	180 (15.15%)	139 (7.37%)	319 (10.37%)
Group Clinical Practice	240 (20.20%)	196 (10.39%)	436 (14.18%)
Hospital Clinical Practice	74 (6.23%)	94 (4.98%)	168 (5.46%)
Industry	2 (0.17%)	7 (0.37%)	9 (0.29%)
Biopharma Consulting	1 (0.08%)	1 (0.05%)	2 (0.07%)
Administrative Position	1 (0.08%)	2 (0.11%)	3 (0.10%)
Health & Science Policy	7 (0.59%)	10 (0.53%)	17 (0.55%)
Miscellaneous	3 (0.25%)	2 (0.11)	5 (0.16%)
Total	1,188 (100.00%)	1,887 (100.00%)	3,075 (100.00%)

Last Position	Non-Attendees	Attendees	Total
Academic Researcher	307 (25.84%)	840 (44.52%)	1,147 (37.30%)
Academic Clinician	135 (11.36%)	167 (8.85%)	302 (9.82%)
NIH Staff Scientist	10 (0.84%)	32 (1.70%)	42 (1.37%)
Solo Clinical Practice	213 (17.93%)	218 (11.55%)	431 (14.02%)
Group Clinical Practice	327 (27.53%)	334 (17.70%)	661 (21.50%)
Hospital Clinical Practice	99 (8.33%)	110 (5.83%)	209 (6.80%)
Industry	27 (2.27%)	75 (3.97%)	102 (3.32%)
Biopharma Consulting	17 (1.43%)	38 (2.01%)	55 (1.79%)
Administrative Position	26 (2.19%)	48 (2.54%)	74 (2.41%)
Health & Science Policy	16 (1.35%)	17 (0.90%)	33 (1.07%)
Miscellaneous	11 (0.93%)	8 (0.42%)	19 (0.62%)
Total	1,188 (100.00%)	1,887 (100.00%)	3,075 (100.00%)

Extraordinary achievements concentrated in the group of treated scientists

	Nobel Prize	NAS/NAM Member	Howard Hughes Med. Investigator	NIH MERIT [R37] Awardee
Non-Attendees	0 (0.00%)	15 (1.26%)	0 (0.00%)	14 (1.18%)
Attendees	7 (0.37%)	88 (4.66%)	32 (1.70%)	79 (4.19%)
Total	7 (0.23%)	103 (3.35%)	32 (1.04%)	93 (3.02%)

ATP selection process in theory



Method of Selection—Matching Program

Appointments are based upon intellectual attainment and demonstrated research interest and ability. A man's background in research is often a decisive factor in making selections. This applies more significantly in certain areas—such as internal medicine and psychiatry—than in others—such as surgery and radiation therapy.

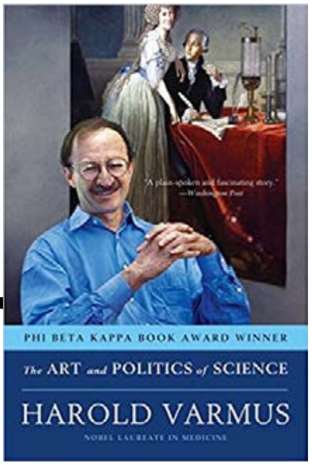
All applications are carefully considered; but it should be understood that successful candidates have outstanding records in medical school and their references indicate that they have exceptional research training and/or potential.

Associates are selected by a system of matching the candidates' program-area preferences against nominations made by the Institutes (similar to NIMP, Inc.).

In his packet of forms, a candidate will find several sheets, each headed "Program Area Selection Check List." After reading Part Three of this catalog, he should check off on these sheets the areas in which he is interested. He does not indicate his preferences at this point, and he is not limited to any particular number of choices. The check marks that he makes will determine the offices and laboratories to which his application will be circulated at the National Institutes of Health.

After thorough review of all candidates' qualifications by the Institutes, a limited number of candidates will be selected for personal interviews to be held during a 3-week period from June 10 through 28. Candidates should be prepared to come to NIH for an interview on short notice on any date within this period, at their own expense. All interviews are by invitation and will be arranged through the Chief, Clinical and Professional Education. Following interviews, candidates will be requested to indicate their preferences, which are kept in confidence and used exclusively for matching against the Institutes' nominations. Successful candidates will be notified on July 15 and succeeding days and be given an opportunity to accept or reject the positions for which they were matched.

In practice, selection was often ad hoc…



"During my long interview day, I met with several well-known laboratory chiefs, most of whom were not especially encouraging. But one sympathetic senior scientist, the endocrinologist Jack Robbins, saw that my limited experience would probably keep me from being selected, and he suggested that I speak with Ira Pastan, a young NIH investigator who had recently established his own laboratory to study the production of hormones by the thyroid gland.

This recommendation proved to be wise and fateful. ***My schooling in literature turned out to be more important than my interest in endocrinology, Ira's field, because Ira's wife Linda, a poet, had often complained that Ira's colleagues seldom talked about books. Ira, himself an enthusiastic reader, thought it might be helpful to have someone with my background in his lab.*** *When the matches were announced, I was told I would become Ira's first clinical associate, having been passed over by the more famous senior investigators I had ranked higher on my list. This outcome could not have been more fortunate."*

Research Design (or lack thereof…)

- ***Poor man's identification strategy***
  - *No IV (draft lottery not binding on this population)*
  - *No RDD either*

- ***Selection on observables***
  - *Recall these are second-round applicants, and a lot of weeding out has already taken place*

  - *They are selected on the basis of a relatively short (30 minutes) interview, and psychologists have documented that the process is dominated by noise (e.g., Dana et al. 2013)*

  - *The observables we do have (med school, internship hospital, prior research record) do predict selection, but not strongly*
    - *Incorporating selection under ignorability does not shrink the naïve cross-sectional estimates by much*

Econometric Modeling

- **Step one: estimate a propensity score**

$$e(X_i)=\text{Prob}(\text{TRAINING}_i=1|X_i)$$

- **Step two: create inverse probability of treatment weights. For the case of the Average Treatment Effect (ATE):**

$$w_i = \begin{cases} \frac{1}{1-\hat{e}(X_i)} \; if\ TRAINING_i = 0 \\ \frac{1}{\hat{e}(X_i)} \; if\ TRAINING_i = 1 \end{cases}$$

- **Estimate outcome equation by weighted least squares (or weighted logit, or weighted Poisson…) where the weights are equal to each observation's IPT.**

$$E[y_i|X_i] = \beta_0 + \beta_1'Z_i + \beta_2\text{TRAINING}_i$$

Modeling selection into the ATPs

	Parsimonious Model		Draft Lottery Subsample		Penalized Logit with Med School FEs [Lasso]
	(1a)	(1b)	(2a)	(2b)	(3)
Log(Pre-ATP Nb. of Publications)		0.306**	0.318**	0.318**	0.299**
		(0.068)	(0.076)	(0.076)	(0.041)
Ln(NIH Grants for Applicant's Medical School)	0.330**	0.287**	0.211*	0.211*	
	(0.085)	(0.086)	(0.105)	(0.105)	
Draft Lottery Number Called				0.107	
				(0.102)	
PhD	0.941**	0.589†	0.649	0.654	0.628†
	(0.323)	(0.332)	(0.493)	(0.497)	(0.347)
Applies More than Once	0.098	0.056	0.185	0.181	0.017
	(0.290)	(0.287)	(0.311)	(0.313)	(0.276)
AΩA Honor Medical Society	0.651**	0.663**	0.582**	0.581**	0.760**
	(0.101)	(0.102)	(0.119)	(0.119)	(0.106)
Constant	-2.903†	-2.292	9.249**	10.448**	3.057**
	(1.664)	(1.688)	(2.106)	(2.157)	(0.596)
Pseudo-R^2	0.222	0.237	0.133	0.133	
λ					0.74
Log-likelihood	-1,596	-1,565	-1,139	-1,138	-1,516
Nb. of Applicants	3,075	3,075	1,898	1,898	3,075

Research Outcomes [IPTW Poisson estimates]

	X-Sect.	Logit Weights		Lasso Weights	
	Naive	ATE	ATT	ATE	ATT
Career Nb. of Pubs	0.621** (0.072)	0.497** (0.085)	0.495** (0.106)	0.454** (0.099)	0.456** (0.126)
Career Nb. of PI Pubs	0.625** (0.071)	0.470** (0.090)	0.466** (0.115)	0.437** (0.105)	0.436** (0.135)
Career Citations	0.815** (0.095)	0.640** (0.113)	0.681** (0.136)	0.596** (0.125)	0.608** (0.155)
Career NIH Grants ($ 2015)	0.908** (0.210)	0.651** (0.237)	0.696** (0.267)	0.700** (0.221)	0.761** (0.262)
Career NIH R01 Grants ($ 2015)	0.853** (0.151)	0.541** (0.187)	0.570** (0.215)	0.488* (0.244)	0.456 (0.302)
Nb. of Patents	0.899** (0.201)	0.443† (0.236)	0.448† (0.270)	0.291 (0.317)	0.201 (0.370)
Nb. of Citations to Pubs. in Patents	1.101** (0.132)	0.842** (0.156)	0.933** (0.178)	0.800** (0.174)	0.824** (0.214)
Nb. of Citations to Patents in Patents	0.867** (0.230)	0.507* (0.258)	0.584† (0.301)	0.424 (0.299)	0.424 (0.359)

Career Choice [IPTW Poisson estimates]

	X-Sect.	Logit Weights		Lasso Weights	
	Naive	ATE	ATT	ATE	ATT
First Job in Academia	0.256**	0.202**	0.175**	0.184**	0.180**
	(0.030)	(0.038)	(0.047)	(0.040)	(0.051)
Ends Career in Academia	0.331**	0.302**	0.253**	0.267**	0.285**
	(0.046)	(0.063)	(0.072)	(0.061)	(0.079)
Researcher First Job	0.377**	0.334**	0.321**	0.307**	0.320**
	(0.037)	(0.049)	(0.060)	(0.049)	(0.064)
Ends Career as Researcher	0.526**	0.492**	0.470**	0.464**	0.514**
	(0.052)	(0.072)	(0.084)	(0.072)	(0.096)
First Job in Clinical Practice	-0.524**	-0.456**	-0.444**	-0.374**	-0.410**
	(0.051)	(0.072)	(0.072)	(0.061)	(0.077)
Ends Career in Clinical Practice	-0.396**	-0.352**	-0.324**	-0.304**	-0.333**
	(0.038)	(0.062)	(0.055)	(0.047)	(0.060)
Years of Post-graduate Training	0.084**	0.085**	0.078**	0.083**	0.075**
	(0.011)	(0.015)	(0.020)	(0.015)	(0.021)
Nb. of Career Years (censored in 2017)	-0.014*	-0.011	-0.011	-0.011	-0.003
	(0.006)	(0.009)	(0.012)	(0.010)	(0.014)

Publ. Quality [IPTW Poisson estimates]

	X-Sect.	Logit Weights		Lasso Weights	
	Naive	ATE	ATT	ATE	ATT
Career Nb. of Pubs, Total (with cit. data available)	0.642** (0.072)	0.506** (0.085)	0.509** (0.105)	0.469** (0.099)	0.469** (0.126)
Career Nb. of Pubs, Top 50% of the Cit. Distrib.	0.720** (0.077)	0.588** (0.087)	0.600** (0.106)	0.541** (0.102)	0.546** (0.129)
Career Nb. of Pubs, Top 25% of the Cit. Distrib.	0.771** (0.082)	0.624** (0.096)	0.649** (0.116)	0.580** (0.111)	0.590** (0.138)
Career Nb. of Pubs, Top 5% of the Cit. Distrib.	0.847** (0.099)	0.683** (0.118)	0.723** (0.143)	0.633** (0.131)	0.653** (0.161)
Career Nb. of Pubs, Top 1% of the Cit. Distrib.	0.910** (0.130)	0.693** (0.162)	0.747** (0.196)	0.637** (0.173)	0.647** (0.212)
Career Nb. of Pubs, Top 1‰ of the Cit. Distrib.	0.877** (0.192)	0.522* (0.248)	0.559† (0.301)	0.465† (0.262)	0.441 (0.317)

Concluding thoughts/questions

- ***Are we just "shooting fish in a barrel"? Probably not…***
  - *Institutional details surrounding the selection process*
  - *Refined outcomes (e.g., share of translational research publications)*

- ***So is the only thing we need another war?***
  - *Some current experiments in training aim to reproduce the hothouse environment (HHMI's Janelia Farm Campus, e.g., Rubin 2006)*

- ***But reasons to be pessimistic***
  - *The effects might have been large and long-lasting precisely because the exposure received was intense*
    - *How much dilution is allowable before results start to fade?*

  - *Not just about shifting aspiration levels; actual skill building is needed to become a frontier innovator*
  - *Potentially high returns to designing and testing exposure interventions*