Biomedical Research Workforce Working Group

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CHARGE

1. Develop a model for a sustainable and diverse U.S. biomedical research workforce that can inform decisions about training of the optimal number of people for the appropriate types of positions that will advance science and promote health.

2. Based on this analysis and input from the extramural community, the committee will make recommendations for actions that NIH should take to support a future sustainable biomedical infrastructure.

Roster

Shirley Tilghman, Princeton University, N.J., *co-chair*

Sally Rockey, NIH, *co-chair*

Sandra Degen, University of Cincinnati and Cincinnati Children's Hospital

Laura Forese, New York Presbyterian Hospital/Weill Cornell Medical Center

Donna Ginther, University of Kansas

Arthur Gutierrez-Hartmann, University of Colorado Denver

Freeman Hrabowski, University of Maryland, Baltimore County

James Jackson, University of Michigan, Ann Arbor

Leemor Joshua-Tor, Cold Spring Harbor Laboratory

Richard Lifton, Yale School of Medicine

Garry Neil, Johnson & Johnson

Naomi Rosenberg, Tufts University School of Medicine

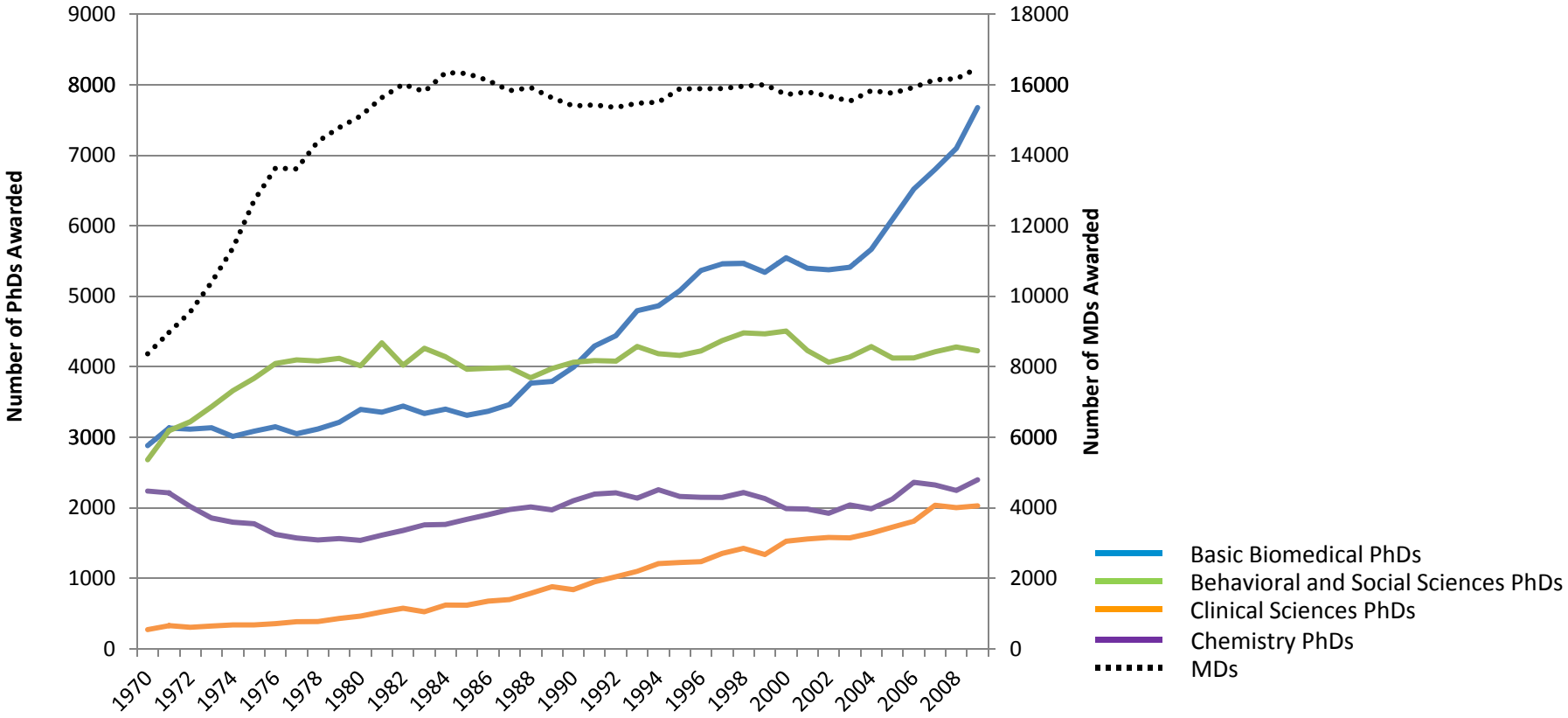
Bruce A. Weinberg, Ohio State University

Keith Yamamoto, University of California, San Francisco

Preconceived Notions

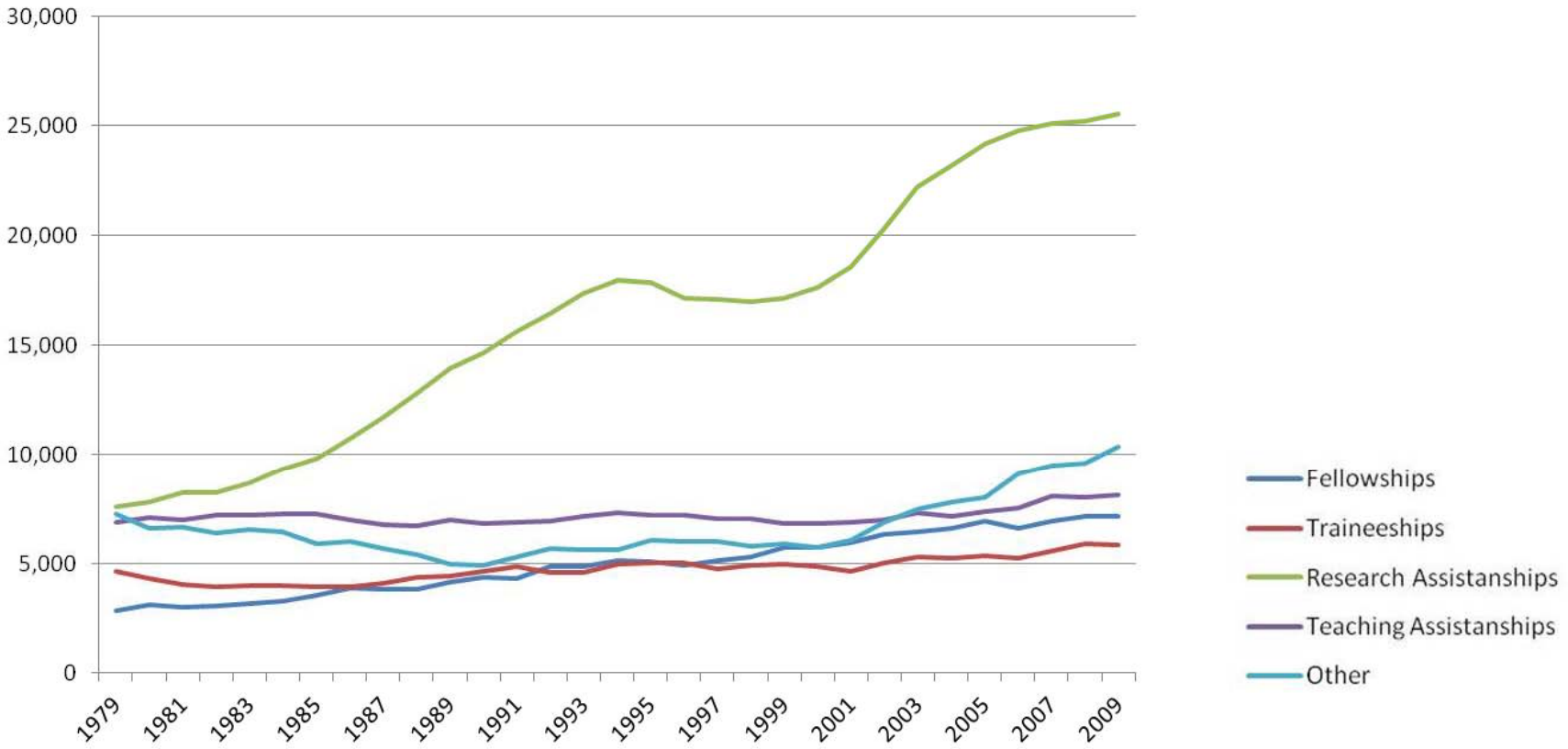
1. Training for a career in biomedical research is taking too long
2. Training is getting longer every year
3. Too many Ph.D.s are being produced for the number of jobs that take advantage of the training
4. The average age of an investigator receiving his or her first R01 is approaching 42 years of age
5. These conditions are turning away the “best and the brightest”
6. While all of the above may be true, the enterprise is immensely productive, and should not be changed

US PhD and MD Degrees Awarded, by Field



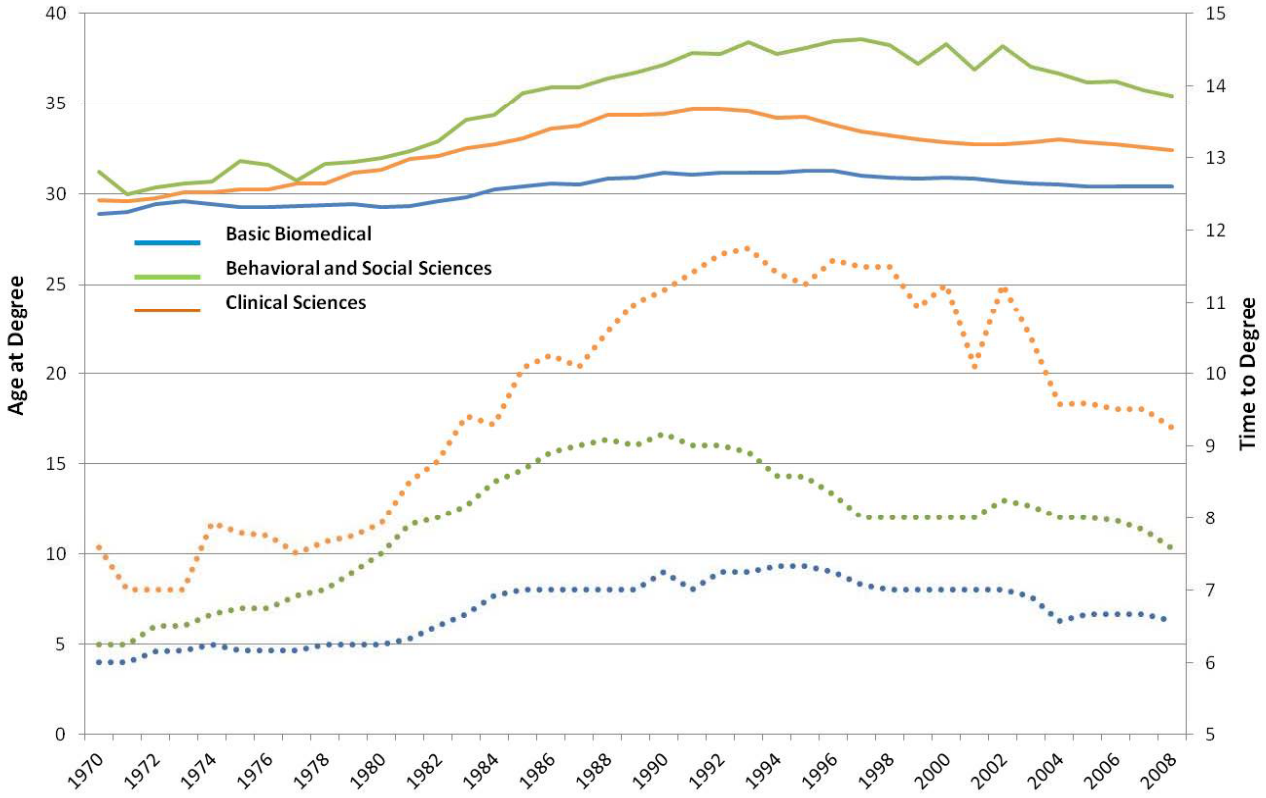
Source: Survey of Earned Doctorates

Doctorate Students by Type of Support



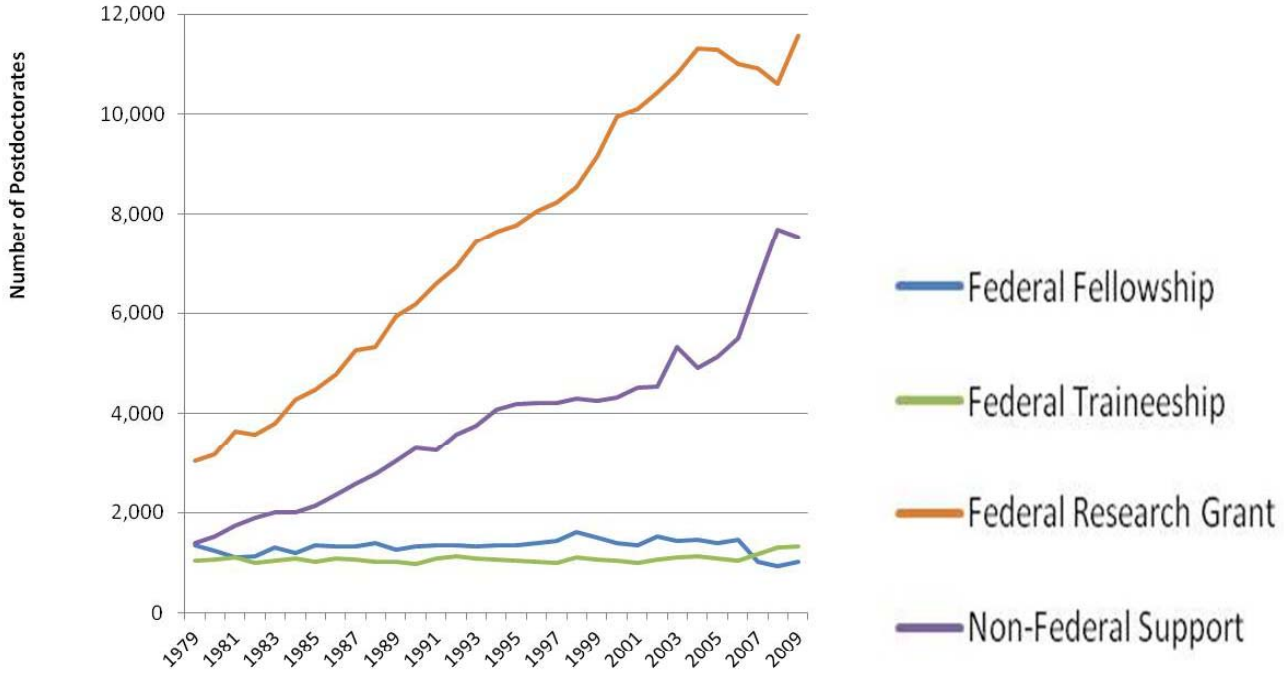
Source: Graduate Student Survey

Time to Degree and Age at Degree



Source: Survey of Earned Doctorates

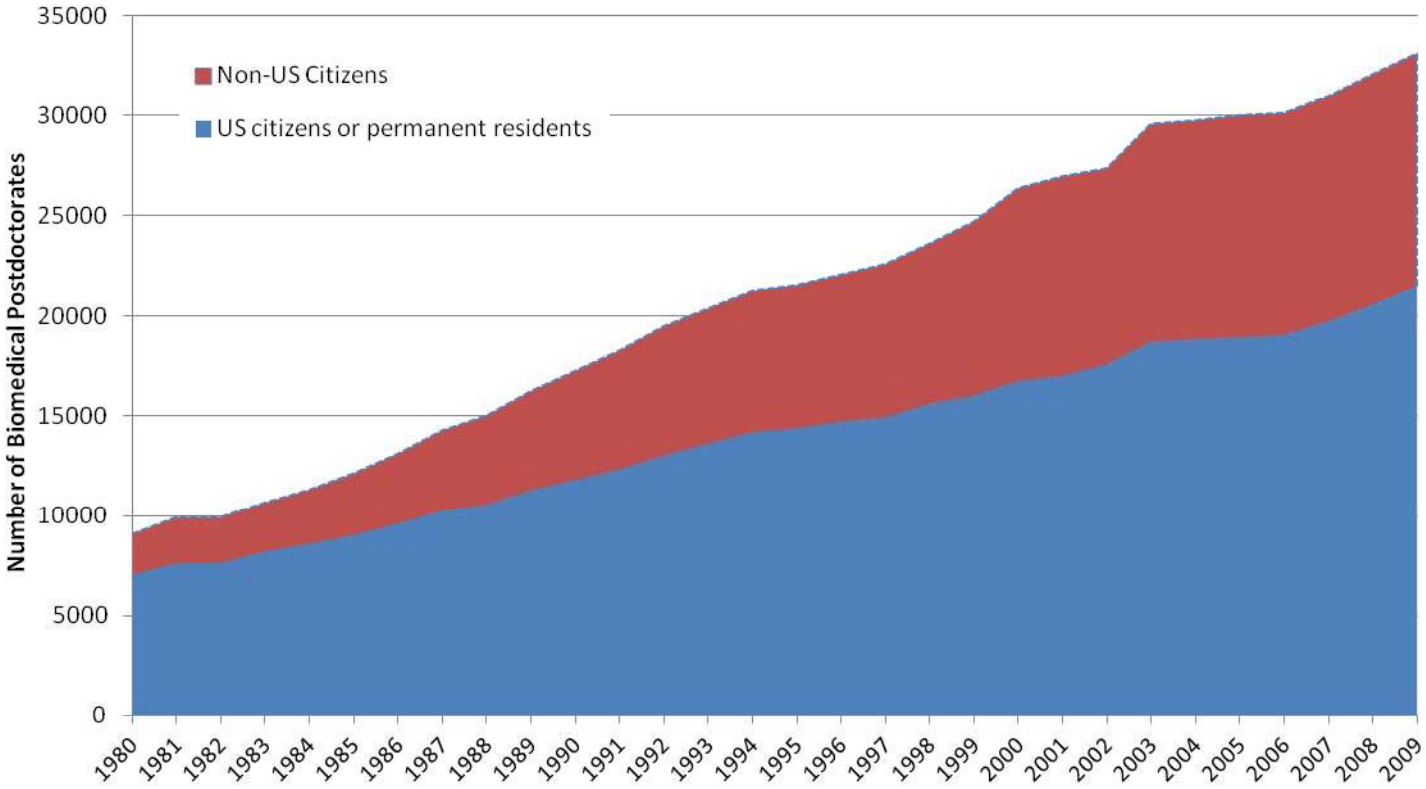
Postdoctoral Researchers by Type of Support



Note: "nonfederal support" is defined as support from state and local government, institutions, foreign sources, foundations, industry and other private sources.

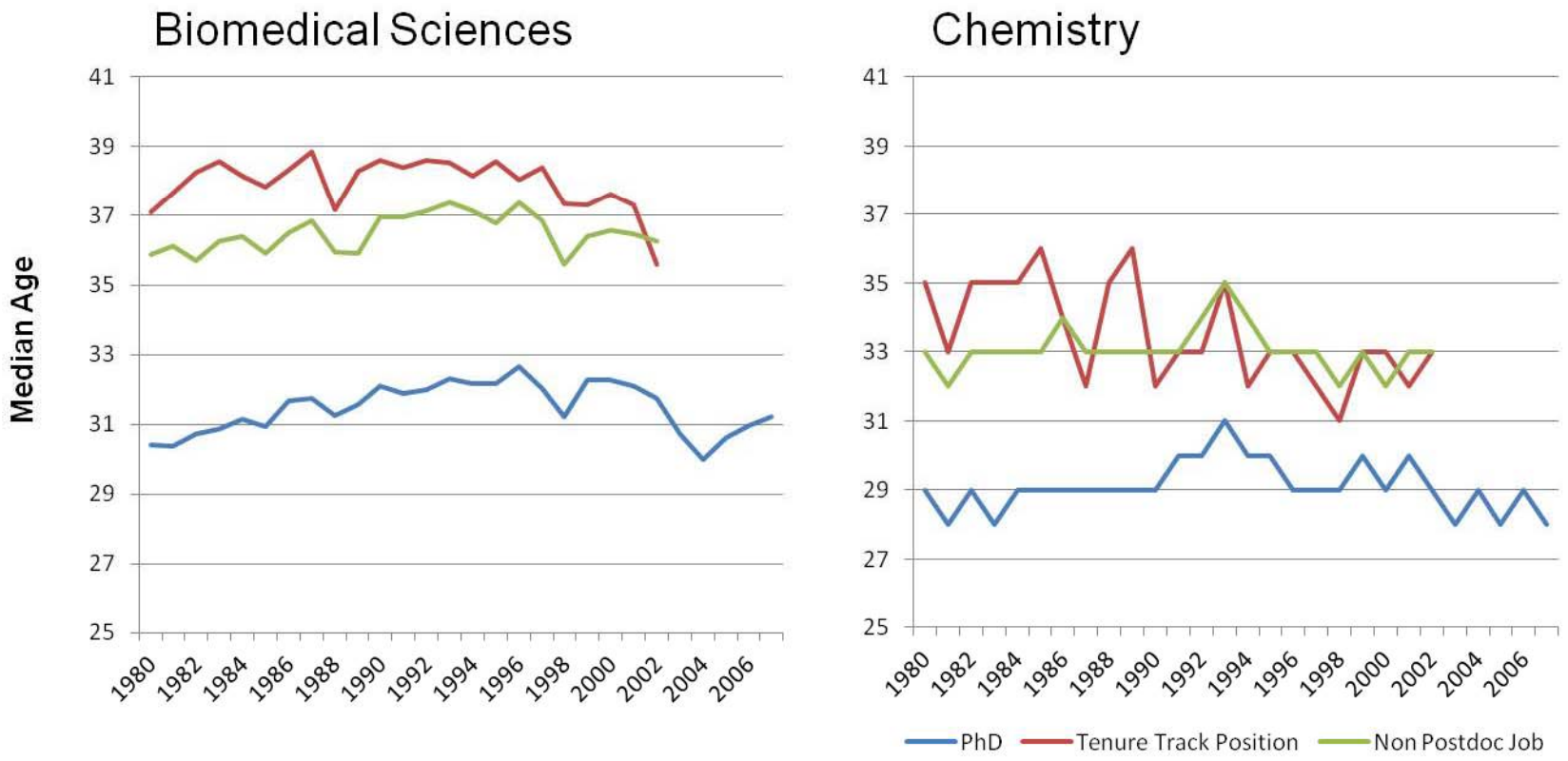
Source: Graduate Students and Postdoctorates Survey

Biomedical Postdoctorates by Citizenship



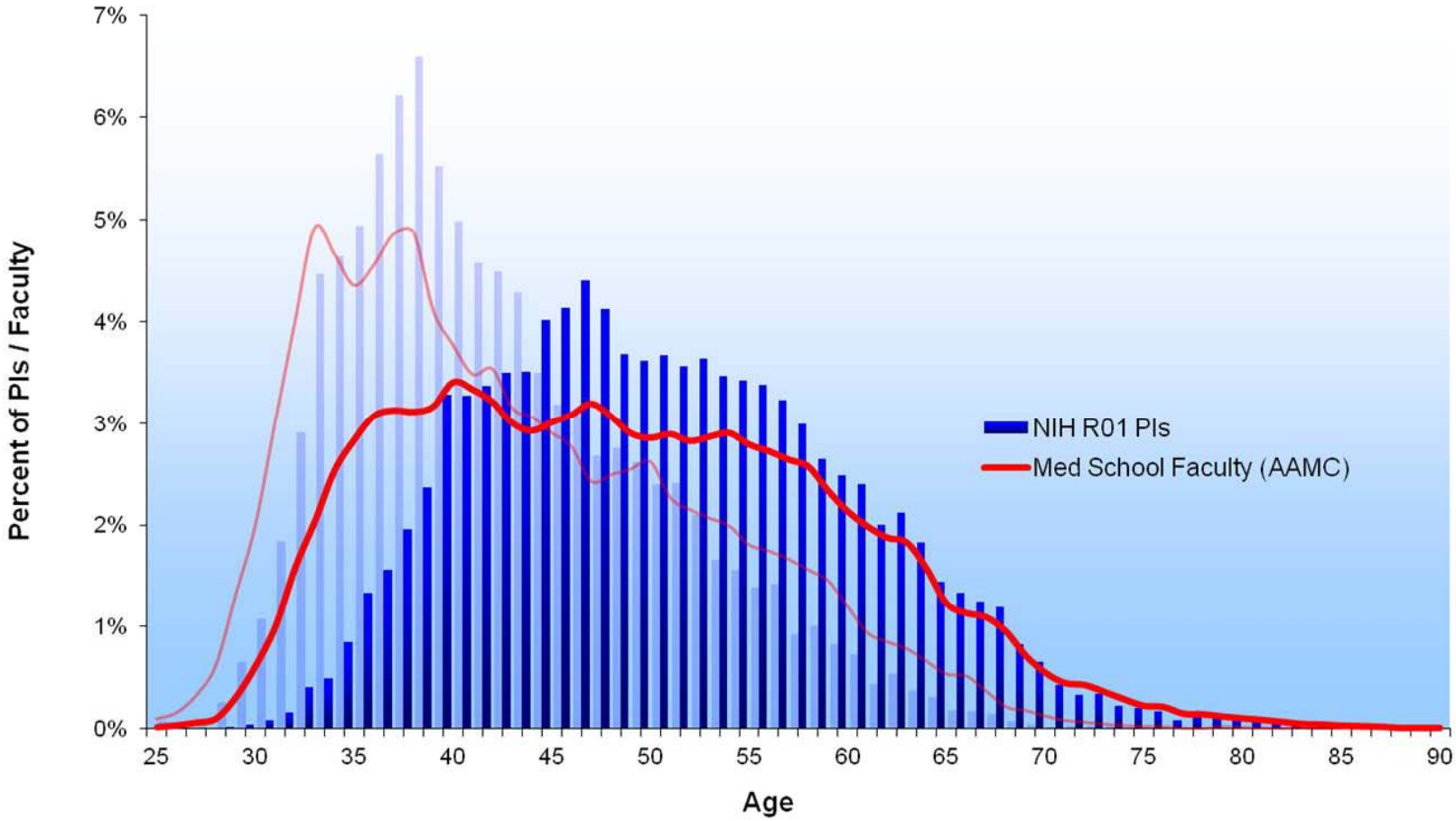
Source: Graduate Student Survey

Age at First PhD, First Non Postdoctoral Job, First Tenure Track Job, for US trained Doctorates



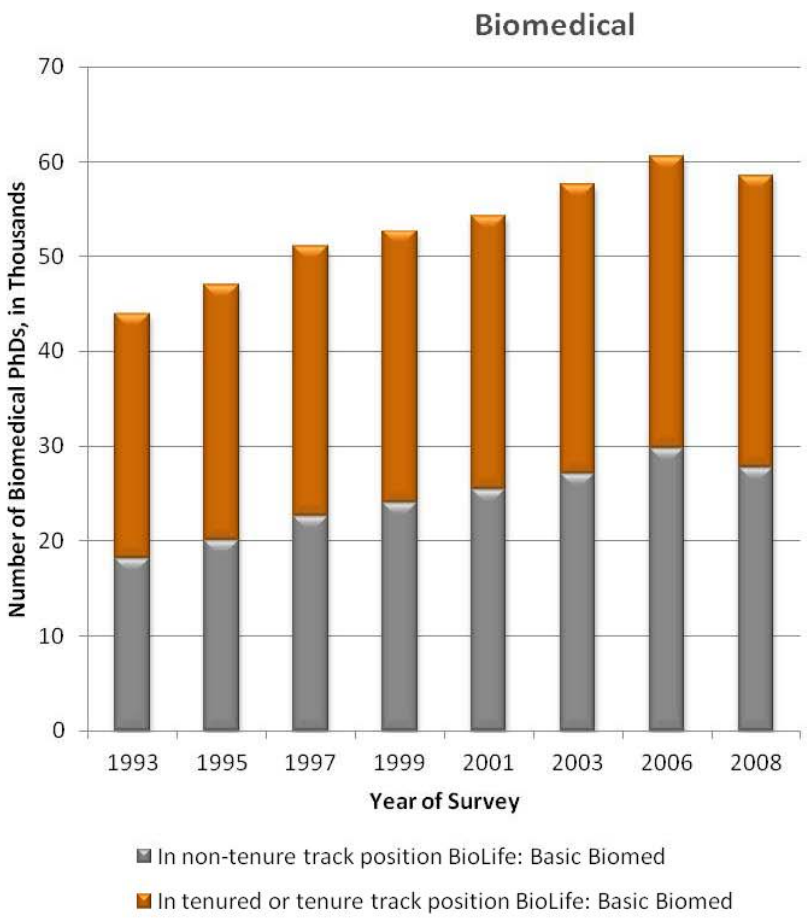
Source: Survey of Earned Doctorates

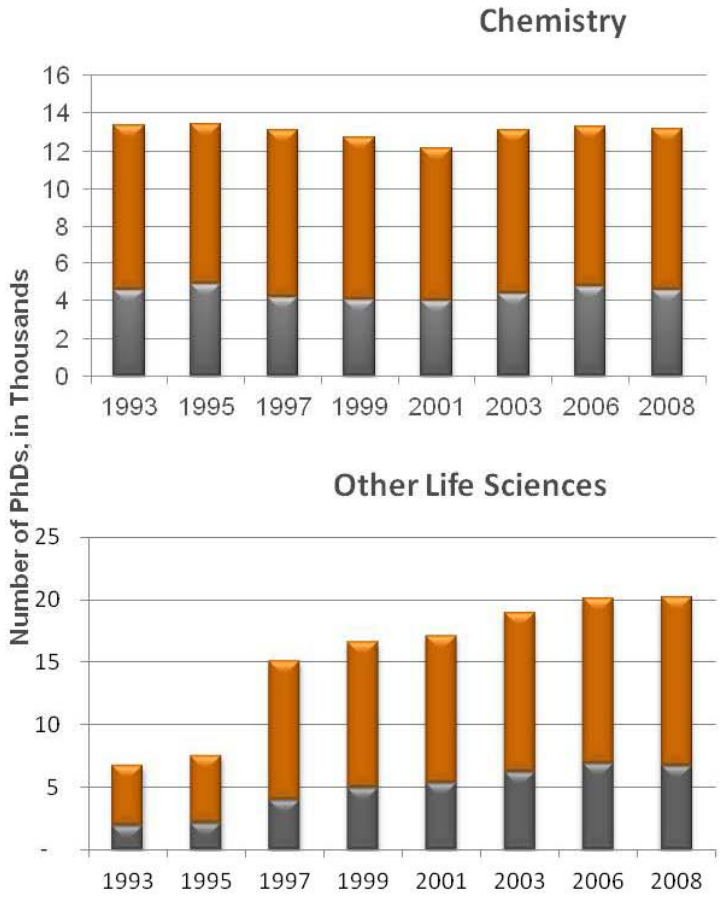
Age Distribution in 1980 (background) and 2010 (foreground)



Sources: NIH and AAMC

U.S. Trained PhDs in academic employment, by tenure track status





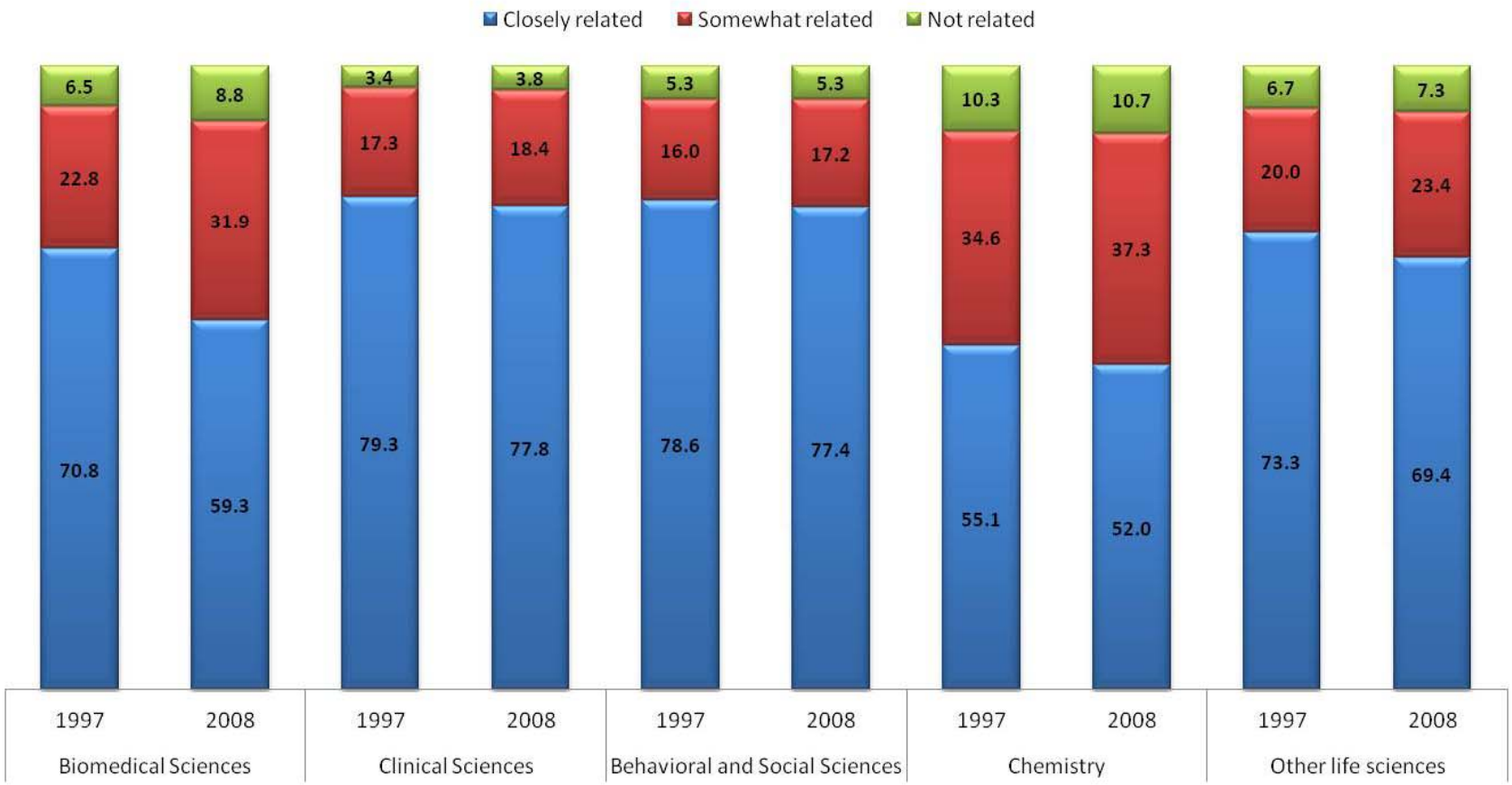
Source: Survey of Doctorate Recipients

Earnings comparison

Years Since PhD	BioMed	Comp/ Math	Physical Science	Social Science	Engineer
0	51,594	66,804	57,775	55,532	72,992
10	87,766	99,972	94,180	87,853	113,314
30	123,959	109,277	122,148	107,321	133,292

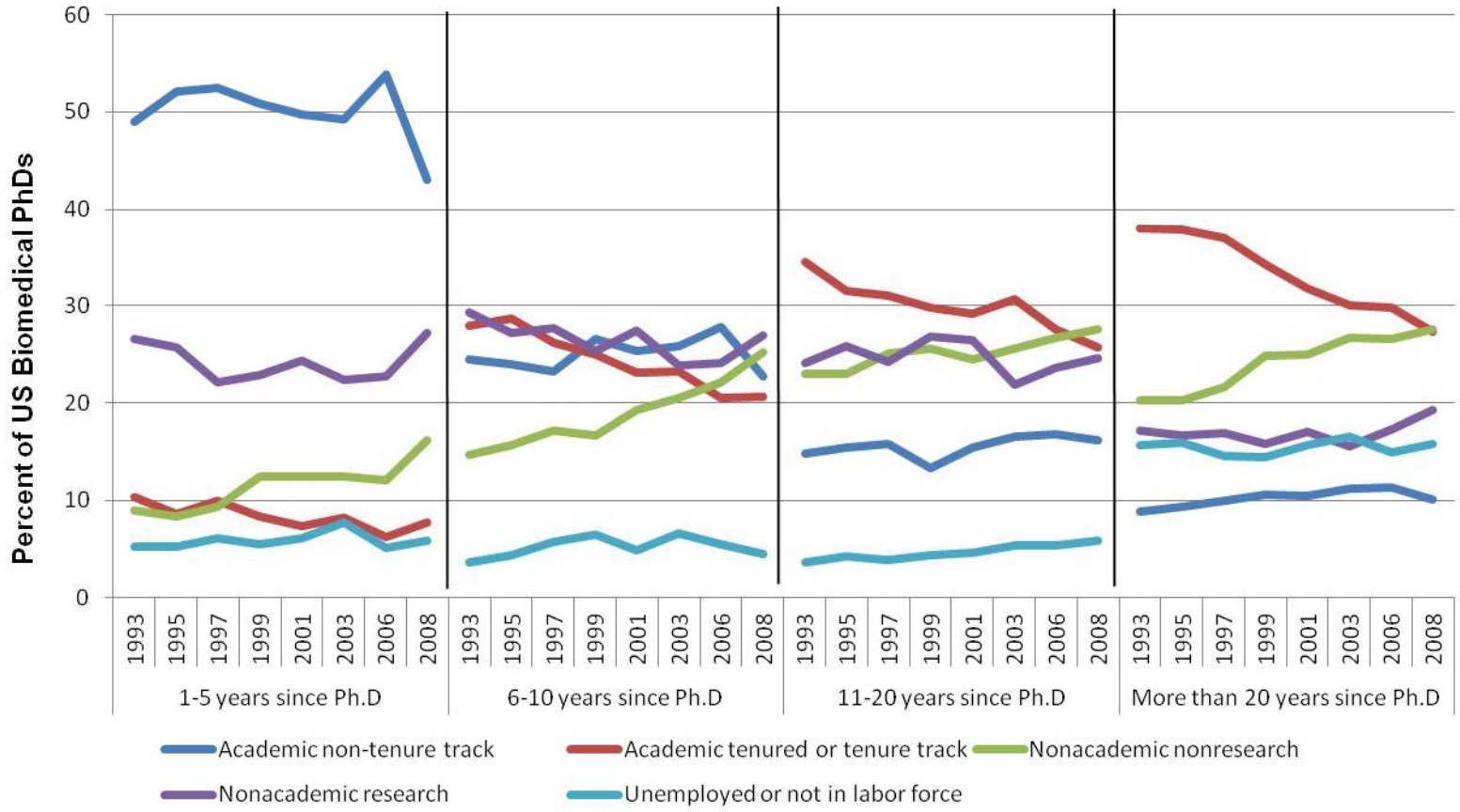
Source: Survey of doctorate recipients

Relationship between Science and Engineering PhD Field and Occupation



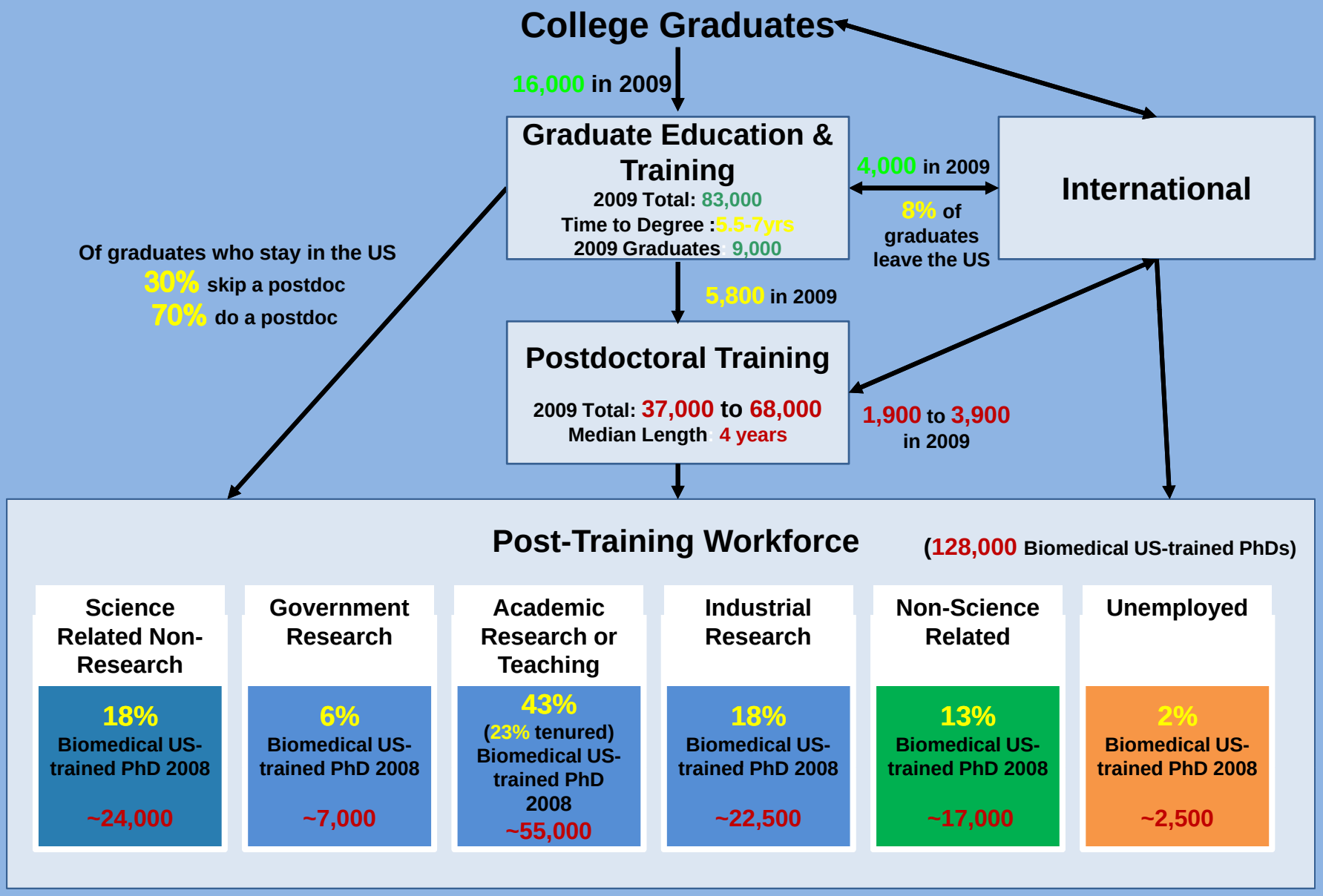
Source: Survey of Doctorate Recipients

U.S. Trained Biomedical PhD employment, by Years Since Degree



Source: Survey of Doctorate Recipients

PhD Biomedical Research Workforce



Conclusions

- Weighing all the data analyzed, the working group concluded that :
  - The combination of the large upsurge in US-trained PhDs, increased influx of foreign-trained PhDs, and aging of the academic biomedical research workforce make launching a traditional, independent, academic research career increasingly difficult.
  - The long training time and relatively low early-career salaries when compared to other scientific disciplines and professional careers may make the biomedical research career less attractive to the best and brightest of our young people.
  - The current training programs do little to prepare people for anything besides an academic research career, despite clear evidence that a declining percentage of graduates find such positions in the future.

Goal of Recommendations

- **Modify the career paths in biomedical research in a timely fashion in order to:**
  - Attract and retain the best and most diverse scientists, engineers and physicians from around the world
  - Increase the number of domestic students from diverse backgrounds who excel in science and become a part of the STEM workforce.
  - Better prepare biomedical PhD students and postdoctoral researchers to participate in a broad-based and evolving economy.

Graduate Students

- Create competitive supplement to training grants to develop and demonstrate:
  - Enhanced training experiences matched to demonstrated career outcomes
  - Reduced time to degree
  - Better tracking and publication of career outcomes
  - Provide pathways to other degree programs, such as Masters degrees for specific science-oriented career outcomes.
- Cap the number of years a graduate student can be supported by NIH funds (any combination of Ts, Fs, and RPGs),
  - Six year individual limit, with an institutional average of 5 years
  - Longer cap for physician scientists
- Increase the proportion of graduate students supported by training grants and fellowships
  - Trainees and fellows are more successful
  - Accomplish without increasing the overall number.
- Revise the peer review criteria for training grant
  - Include consideration of the outcomes of all students (not just trainees) in relevant PhD programs at those institutions
  - Educate study sections to consider a broader range of career outcomes.
- All ICs should offer comparable training grant programs and fellowships
  - Harmonize requirements

Postdoctoral Researchers

- Increase the proportion of postdoctoral researchers supported by training grants and fellowship
  - Fellows are more successful
  - Without increasing the overall number of NIH supported postdocs
- Create competitive pilot program to enable postdoctoral offices to develop ways to enrich and diversify postdoctoral training.
- Increase stipend levels
  - $42,000 at entry
  - Level to level increases of 4% between entry and 3rd year
  - Level to level increases of 6% for years 4 through 7.
  - Apply the same scale to postdoctoral researchers on RPGs.
- Increase benefits available to all NIH-supported postdoctoral researchers
  - Postdocs should receive benefits that are comparable to other employees at the institution.
- Double the number of Early Independence Awards
- Double the number of K99/R00 awards
  - shorten eligibility of the latter to 3 years of postdoc
- Require individual development plans (IDPs) for all NIH-supported postdoctoral researchers.

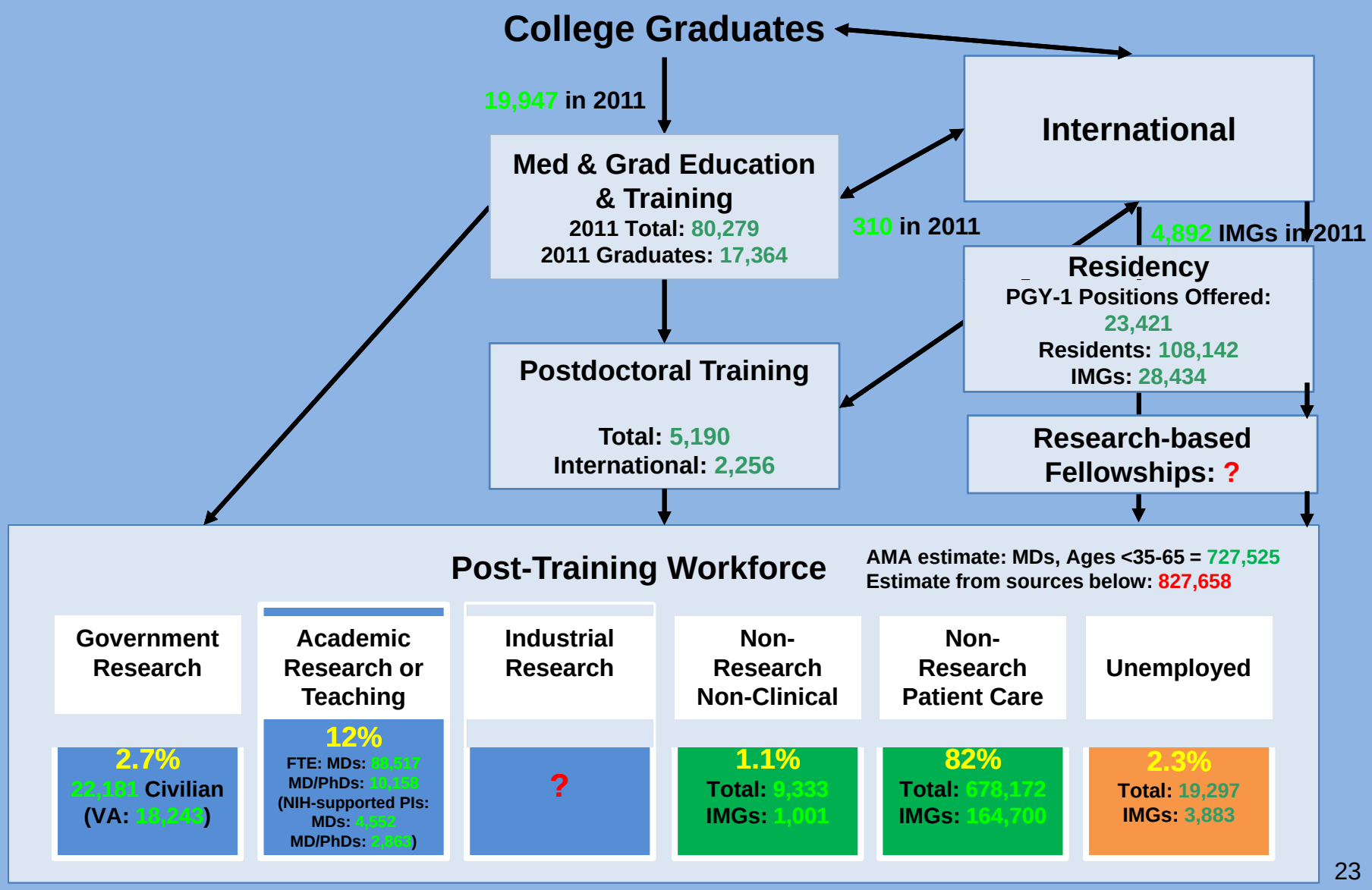
Information Collection, Analysis and Dissemination

- Institutions that receive NIH funding should
  - Track and collect information on the career outcomes of both their graduate students and postdocs
  - Provide the information to NIH
  - Publish this information on the web to inform prospective students/ postdocs
- NIH should work with other federal agencies to address:
  - Identified data gaps, and
  - Collection of relevant and timely information on the biomedical research workforce
- NIH should establish a permanent unit within the Office of the Director to better align policies with workforce needs:
  - Coordinate data collection activities
  - Provide ongoing analysis of the workforce
  - Track students and postdocs
  - Evaluate programs and policies to better align with workforce needs

Other Recommendations

- Staff scientists:
  - The WG encourages NIH study sections to be receptive to grant applications that include staff scientists and urges institutions to create position categories that reflect the value and stature of these researchers.
- Salary Support:
  - NIH should consider a long-term approach (over a 20 year period) to gradually reduce the percentage of funds from all NIH sources that can be used for faculty salary support.
- Diversity:
  - The WG feels that implementation of its recommendations will increase the overall attractiveness of the biomedical research career and consequently its attractiveness to underrepresented ethnic and racial minorities and women.
  - The WG would like to highlight the need for much stronger coordination of the many diversity-related efforts at the NIH and for rigorous evaluation of the outcomes of all programs.

MD & MD/PhD Biomedical Research Workforce



Physician scientists

- The economic and educational drivers which affect the training and career paths of the physician scientist workforce are very different from those underlying PhD research training and career paths.
- The changing landscape of health care and the effects these changes likely will have on academic medical centers need to be projected carefully and considered when analyzing the future physician scientist workforce.
- NIH should conduct a follow-on study that focuses on physician scientists and involves people who train physician scientists, as well as economists who focus on medical education costs, career choices, and the role of these as incentives.