Committee to study the National Needs for Biomedical, Behavioral and Clinical Research Personnel

Committee recommendations along with some personal reflections

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The Composition of the Committee

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J. Chris White ViaSim Corporation (Consultant)
So what are the biomed issues we addressed?

- Grad students on Ts and Fs…or all students?
- Do Ts and Fs foster high quality?
- Postdocs?
- Workforce size?
- What is the workforce and what does it do?
- Role of internationals?
- Workforce turnover
- Diversity
- Data
# The Biomedical Workforce

not including graduate students and postdocs

<table>
<thead>
<tr>
<th>Employer</th>
<th>Employed</th>
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<tbody>
<tr>
<td>State Government</td>
<td>3,600</td>
</tr>
<tr>
<td>Federal Government</td>
<td>12,200</td>
</tr>
<tr>
<td>Self-Employed</td>
<td>3,000</td>
</tr>
<tr>
<td>University</td>
<td>62,000</td>
</tr>
<tr>
<td>Other Educational</td>
<td>2,500</td>
</tr>
<tr>
<td>Private, For Profit</td>
<td>20,850</td>
</tr>
<tr>
<td>Private, Not For Profit</td>
<td>4,360</td>
</tr>
<tr>
<td>Physical Scientists in Biomed</td>
<td>8,200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>134,700</strong></td>
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# First Year Enrollment in Biomedical PhD Programs

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Biochemistry, Biophysics, and Structural Biology</td>
<td>1334</td>
<td>1385</td>
<td>1556</td>
<td>1445</td>
<td>1437</td>
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<tr>
<td>Biomedical Engineering and Bioengineering</td>
<td>716</td>
<td>784</td>
<td>921</td>
<td>938</td>
<td>924</td>
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<tr>
<td>Cell and Developmental Biology</td>
<td>1365</td>
<td>1464</td>
<td>1558</td>
<td>1556</td>
<td>1610</td>
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<tr>
<td>Genetics and Genomics</td>
<td>594</td>
<td>582</td>
<td>654</td>
<td>674</td>
<td>619</td>
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<tr>
<td>Immunology and Infectious Disease</td>
<td>712</td>
<td>728</td>
<td>774</td>
<td>803</td>
<td>812</td>
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<tr>
<td>Integrated Biomedical Sciences</td>
<td>1288</td>
<td>1367</td>
<td>1398</td>
<td>1497</td>
<td>1519</td>
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<tr>
<td>Microbiology</td>
<td>669</td>
<td>672</td>
<td>731</td>
<td>728</td>
<td>688</td>
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<tr>
<td>Neuroscience and Neurobiology</td>
<td>761</td>
<td>891</td>
<td>957</td>
<td>886</td>
<td>913</td>
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<tr>
<td>Pharmacology, Toxicology and Environmental Health</td>
<td>812</td>
<td>825</td>
<td>844</td>
<td>886</td>
<td>822</td>
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<tr>
<td>Physiology</td>
<td>397</td>
<td>417</td>
<td>481</td>
<td>456</td>
<td>445</td>
</tr>
<tr>
<td>Total</td>
<td>8648</td>
<td>9115</td>
<td>9874</td>
<td>9869</td>
<td>9789</td>
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</tbody>
</table>

Source: A Data Based Assessment of Research-Doctorate Programs, 2010
Doctorates in the Biomedical Sciences
1970 to 2008
The graph shows the percentage of NIH investigators in different age groups from 1980 to 2005. The age groups are divided as follows:

- **35 years old & younger**
- **36-45 years old**
- **46-55 years old**
- **Over 55 years old**

The data indicates a decrease in the percentage of younger investigators over time, with an increase in the percentage of older investigators.
Where do we stand?

The workforce is really the “managers” and the grad students and postdocs, especially in the research university setting.
We may be educating more “workers” than we need for the current careers options.
We do need this size workforce for the ROI’s available.

So, is this an unresolvable contradiction?
NIH Spending on Training Grants and Fellowships

Source: [http://officeofbudget.od.nih.gov/UI/HistoricalBudgetRequests.htm](http://officeofbudget.od.nih.gov/UI/HistoricalBudgetRequests.htm)
NIH Support of Graduate Students

Number of Students supported

Years


- Fellowships
- Traineeships
- Research Assistantships
Biomedical PhDs by Citizenship and Race/Ethnicity, 1973 – 2008
Minority PhDs

Minorities PhDs in the Biomedical, Behavioral and Clinical Sciences

Years


Biomedical  Clinical  Behavioral
The # of URM students at an institution correlates with the # of Institutional Training Grants
Biological and Medical Sciences Postdocs by Citizenship/Visa Status

Postdoctoral Support in the Biomedical Sciences

![Graph showing the number of postdoctoral support in the biomedical sciences from 1979 to 2008. The graph indicates a consistent increase in the number of postdoctoral researchers supported by non-federal sources, research grants, traineeships, and fellowships over the years.]
Workforce Recommendation

The total number of NRSA positions in the biomedical and clinical sciences should remain at least at the fiscal year 2008 level, and in the behavioral sciences they should increase back to the 2004 level. Furthermore, future adjustments should be closely linked to the total extramural research funding in the biomedical, clinical and behavioral sciences.
Large Cost Implications

(1) NIH should reinstitute its 2001 commitment to increase stipends at the predoctoral and postdoctoral levels for NRSA trainees. This should be done by budgeting regular, annual increases in postdoctoral stipends until the $45,000 level is reached for first year appointments, and stipends should increase at the cost of living thereafter. Predoctoral stipends should also be increased at the same proportional rate as postdoctoral stipends and revert to cost of living increases once the comparison postdoctoral level reaches $45,000.
Large Cost Implications (cont.)

(2) The size of the MST Program should be expanded by at least 20 percent, and more if financially feasible.

(3) NIH should consider an increase in the indirect cost rate on NRSA training grants and K Awards from 8 percent to the negotiated rate currently applied to research grants. The increase in the rate could be phased in over time.
Responsible Conduct of Research

All graduate students and postdoctoral fellows who are supported by the NIH on Research Program Grants (RPGs) should be required to incorporate certain additional “training grant-like” components into their regular academic training program. These should include RCR training, exposure to quantitative biology, and career guidance and advising.
Diversity

Graduate Student and Postdoctoral Training Programs which educate and train students who are funded by RPGs should be subject to the same expectations for diversity of trainees that are expected of training grants. Such programs should be required to provide assurance on ROI grant applications that efforts are being made to increase diversity, though it will likely have to be at an institutional level.
Mentoring

The NIH should expand the K24 mentoring award mechanism to include the basic sciences, and adapt the K24 mechanism to provide the opportunity for established mid-career faculty to mentor early stage investigators in the basic sciences, including recipients of the the new R00 awards (Phase 2 of the Pathways to Independence Award–K99/R00 Award). Additionally, the K24 Award mechanisms, for both basic and clinical mid-career faculty, should be utilized to enhance institutional efforts to recruit and develop a diverse faculty. Specifically, the NIH should develop a new category of K24 awards targeted to enhance the success of early stage basic and/or clinical investigators, or reserve a fraction of existing K24 awards for mid-career applicants whose mentees will include one or more URM faculty members.
Non-traditional Careers

• Peer reviewers in evaluating training grant applications, especially competing renewals, should be instructed to broaden their conception of “successful” training outcomes to recognize non-traditional outcomes that meet important national priorities and needs in the biomedical, behavioral, and clinical sciences.

• One highly needed and extremely valuable outcome for biomedical and behavioral sciences trainees to teach middle and high school science. The NIH and the Department of Education should work to provide incentives that would attract trainees into these teaching careers and lead a national dialogue to accelerate the processes of teacher accreditation controlled by the individual states.
Biomedical Sciences

• MST Programs should be encouraged to include basic behavioral and social science training relevant to biomedical and health sciences research

• MSTP Programs should also be encouraged to intensify and document their efforts to identify and recruit qualified nontraditional, under-represented groups (women and minorities). These efforts should be a factor in the evaluation of all requests for MSTP funding increases and be conditions for receipt of any MSTP funding increases. Success depends on having a critical mass (not isolated examples) of underrepresented trainees in any given MST Program

• All institutes should be encouraged to make F30 fellowships accessible to qualified M.D./Ph.D. students
Data collection

• The NIH should collect reliable data on all of the educational components that it supports, and in such a manner that this information can be stored in an easily accessible database format. Such data might consist of important components of the training grant tables, as well as retention and subsequent outcomes.

• The committee recommends that the data tables be reviewed and a determination made, in consultation with the awardee community, as to which are really essential for reviewing the proposal and which should be incorporated into the databases.
Program Evaluation

• A training evaluation questionnaire should be created so that all participants in the full range of NIH funded training vehicles can provide a confidential, unbiased evaluation of the program in which they were trained. The intent of this recommendation is not to provide additional information for the competitive renewal of a particular program, but rather to allow the NIH to evaluate the merit of all of its training approaches broadly.

• The appropriate office at the NIH involved in analyzing these recommendations should issue an annual report to the Director’s Advisory Committee on the status of review and implementation. After approval, such a report should be forwarded to the NRC to be made available the subsequent review committees. In addition, the NIH may wish to invite external experts to provide added insight into the analysis. There are a number of ways that this could be done, but the exact mechanism is left up to the NIH.
Clinical Sciences

The NIH, in consultation with academic medical leadership, identify better training mechanisms for attracting medical students into translational and clinical research and fund pilot programs designed to implement promising new approaches to accomplishing that objective.
Nursing

• T32 programs in nursing should emphasize a more rapid progression into research careers. Criteria for application should include predoctoral trainees who are within eight years of high school graduation, streamlining the requirement for a nursing master’s degree in passing to the Ph.D., and providing support for postdoctoral trainees who are within two years of completion of the Ph.D.

• NINR should (1) increase the number of mid and senior career awards to enhance the number of nurse scientists capable of sustaining programs of research, and (2) increase the length of support for K awards to five years to be consistent with other institutes and centers

• NIH should request additional support from Congress to allow NINR to more closely meet the needs

• NINR should develop and pilot-test a MSTP-like program to support clinical training at the MSN or DNP level for those nursing students wishing to be clinician scientists
Is there a problem with faculty jobs at R1 universities?

- Of course!
- Money is tight.
- 401(k)s got battered in 2008.
- Faculty are healthier than 30 years ago, and they are not retiring as soon as they used to.
- NIH support is hard to get.
- Faculty are increasingly required to get a large fraction of their salary from non-university sources.
- Students do not have as much interest in these positions as they used to have.
AAMC Faculty Tables

Basic Science Faculty
(Tenured / Tenure Track or Non-Tenure Track)

- Tenured or Tenure Track
- non-Tenure Track

# Faculty

PhD Student Long-Term Career Goals & First Position after graduation

- **ORIGINAL Long-Term Career goal at entry (PhD Students)**

- **FINAL Long-Term Career goal at exit (PhD Students)**

- **Position after the PhD**

“Employment” examples on next slide
PhD Students: employment

- Faculty
  - Assistant professor (4-year college)
  - Assistant research professor
  - Adjunct faculty

- Govt.
  - Research analyst (federal govt.)
  - Forensic scientist (state govt.)
  - Research program coordinator (state govt.)

- Industry
  - Senior research scientist
  - Senior consultant

- Other:
  - High School science teacher
  - Coordinator, Center for Science Outreach
  - Medical writer
  - Intern pharmacist
Postdoc Long-Term Career Goals & First Position after VU Postdoc

Long-Term Career goal at entry (Postdocs)

Long-Term Career goal at exit (Postdocs)

Position after Postdoc

"Employment" examples on next slide
Postdocs: employment

• Faculty
  • Research Instructor
  • Instructor

• Other academic appointment
  • Staff scientist
  • Senior imaging research specialist
  • Director of development

• Govt.
  • Science & technology policy fellow (federal govt.)
  • Technical officer (federal govt.)

• Industry
  • Research scientist
  • Chemist
  • Scientist and grant writer
  • Clinical research scientist
Finally, Does this suggest New Recommendations?

The NIH should monitor all trainees (not just Training Grant trainees) to better define the workforce entry numbers. Additional acceptable workforce paths should be identified. All incoming graduate student recruitees should be made aware of the real range of career options and the statistical likelihood of individual outcomes.
# of Tenured Faculty

Basic Science Departments: Tenured PhD faculty

Clinical Science Departments: Tenured PhD faculty
# of Tenure Track Faculty

**Basic Science Departments:**
TT PhD faculty (not tenured)

**Clinical Science Departments:**
TT PhD faculty (not tenured)
# of Non-Tenure Track Faculty

Basic Science Departments:
NTT PhD faculty

Clinical Science Departments:
NTT PhD faculty
Retention of Tenured Faculty
Retention of Tenure Track Faculty
Retention of Non-Tenure Track Faculty

% Retention of NTT PhD Faculty:
Basic Science Departments

% Retention of NTT PhD Faculty:
Clinical Departments
What happens to Faculty that are not retained in basic science departments?

- **NTT & Tenured faculty:** Most leave academic medicine
  - Likely for different reasons
- **TT faculty:** Most remain in academic medicine
Retention of Non-Tenure Track Faculty (by gender)
Retention of Tenure Track Faculty (by gender)
Retention of Tenured Faculty (by gender)
Does gender have an impact on what happens to Faculty that are not retained in basic science departments?

- NTT & Tenured faculty: Majority leave academic medicine
  - Likely for different reasons

- TT faculty: Most remain in academic medicine
Does gender have an impact on what happens to Faculty that are not retained in clinical departments?

- **NTT & Tenured faculty:**
  - Majority leave academic medicine
  - Likely for different reasons

- **TT faculty:** Equally likely to remain or leave academic medicine
Biological and Medical Sciences Postdocs by Source of Support