Causal Factors and Interventions Workshop

National Institutes of Health (NIH)

Bethesda, MD

November 8-9, 2012

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Executive Summary

Diversity in biomedical and behavioral research is an issue that transcends sex, ethnicity, and race. It has become increasingly evident from a solid foundation of social science research that broad expertise enhances the quality of research, and that all groups benefit from diversity in thought and practice. In July 2008, on behalf of the NIH Working Group on Women in Biomedical Careers, the National Institute of General Medical Sciences (NIGMS) published a Request for Applications (RFA) to support research on causal factors and interventions that affect the careers of women in biomedical and behavioral science and engineering. In October 2009, the NIH funded 14 grants to support research in this area.

A November 2012 workshop served as a forum for data presentations from all of the grantees of this trans-NIH initiative, as well as an opportunity for discussion of the results, their implications, and potential next steps regarding implementation. Three groups of presentations, representing 1) observational studies; 2) longitudinal studies; and 3) intervention studies; were each followed by a moderated panel discussion. Four key themes emerged from the presentations and discussion; these are summarized briefly below.

Building Evidence: Framing Gender Equity as a Scientific Problem

- Research on causal factors and interventions regarding gender equity in science and medicine requires scientific rigor in the design, analysis, replication, evaluation, and publication of study data. Effective intervention pilots need more testing for wider implementation. The NIH can help by encouraging the sharing of findings, resources, and tools, as appropriate, as well as by leading by example.
- Multi-faceted, evidence-based interventions should target institutional change and embrace team-science models. Interventions should address the full range of career stages and inequities (gender, racial, and other), as well as be cautious with regard to reliance on traditional definitions of career success.
- Evidence of effectiveness should include a balance of qualitative and quantitative data.
- Data analyses must look broadly at trends and trajectories, considering the science and medicine workforce as a system.

- Populations are heterogeneous, and thus studies to examine gender, racial, ethnic, and field-specific contributions to various issues must be carefully designed and interpreted so as not to generate averaged findings.

Transferring Knowledge to Practice

- Remediating gender inequities (and those attributed to racial, ethnic, and other affiliations) will not be achieved by one-size-fits-all solutions.
- Gender bias is a significant factor in setting and maintaining sex differences in science and medicine. Studies have shown that it is possible to mitigate implicit bias through training.
- Changing culture requires enforceable policies targeted to both individuals and to institutions.
    - The absence of formal structures, policies, and enforcement presents an environment that tends to preserve the status quo, and often entrenches outdated and/or unfair behaviors.
    - Encouraging the formation of Communities of Practice[1] may prompt rule-setting and rule-enforcement.

Achieving Cultural Change

- Team science presents an opportunity to justify the value of all types of diversity.
- The NIH should lead by example to "de-silo" issues that resonate across disciplines, including diversity and inclusion.
- Life experiences exert a significant influence on scientific and career identity.
- Cultural influence can be measured.
    - A positive culture can buffer career challenges.
    - A negative culture can produce dissatisfaction.
- Mentor networks are more effective than mentor dyads.
- Sponsorship is a key element of career progression.

Work-Life Balance: Establishing a Healthy Climate

- Flexibility policies vary widely throughout the range of workplaces where scientists and physicians work.
- Flexibility policies address work-life balance beyond children and parenting, and they can improve workplace satisfaction even for employees not using flexibility programs.
- Institutional flexibility policies are under-recognized and under-used.
- Ingrained academic culture frustrates the use of flexibility policies.

[1]Communities of Practice are formal or informal groups of people who share information and experiences toward personal and professional improvement.

Causal Factors and Interventions Workshop Summary

This workshop, reflecting the first results of funding from the NIH-sponsored RFA, "Research on Causal Factors and Interventions that Promote and Support the Careers of Women in Biomedical and Behavioral Science and Engineering," showcases the findings of a growing body of research focused on understanding — and learning how to address through interventions — differences in rates of progression of men and women in science and medicine careers.

The focus on data collection and analysis that undergirds this agency-wide initiative provides the opportunity for both the NIH and the wider scientific community to better understand the drivers that affect the representation of women at various career levels in the science and medical workforce, as well as to point to additional testable interventions to address trends of underrepresentation.

Findings presented at this meeting, while focused primarily on the representation of women in science and medicine, are relevant to the general issue of scientific and medical diversity. The NIH will carefully consider the results of these and related research studies toward addressing the underrepresentation of women in biomedical and behavioral research.

Introduction and Welcome

Dr. Judith H. Greenberg, Acting Director, NIGMS
Dr. Janine A. Clayton, Associate Director for Research on Women's Health and Director, NIH Office of Research on Women's Health (ORWH)
Dr. Molly Carnes, University of Wisconsin, Madison (co-chair)
Dr. Joan Reede, Harvard Medical School (co-chair)

In July 2008, on behalf of the NIH Working Group on Women in Biomedical Careers, the National Institute of General Medical Sciences (NIGMS) published a Request for Applications (RFA) to support research on causal factors and interventions that promote and support the careers of women in biomedical and behavioral science and engineering. In October 2009, the NIH funded 14 grants estimated to total $16.8 million over four years with support from 11 Institutes and Centers (ICs) as well as four Offices within the NIH Office of the Director.[2]

The aims of the program are to support research on 1) causal factors explaining the current patterns observed in the careers of women in biomedical and behavioral science and engineering; and 2) the efficacy of programs designed to eliminate sex/gender[3,4] disparities and promote the careers of women in these fields. This workshop served as a forum for data presentations from all of the grantees, as well as an opportunity for discussion of the results, their implications, and potential next steps regarding implementation.

Workshop organizers and co-chairs welcomed the group and thanked grantees and funding ICs for the collegial effort that has characterized this trans-NIH initiative. Organizers urged workshop attendees to think critically and creatively about the data gathered, and to appreciate — but not be constrained — by it.

Keynote Address

Dr. Shirley Malcom, American Association for the Advancement of Science

Many past gatherings of scholars and professionals have visited the issue of gender disparities in science and medicine, and these events have fueled extensive societal discussions of potential remedies. Addressing this problem definitively toward identifying solutions deserves rigorous

[2] NIGMS, NCI, NCRR, NHLBI, NIA, NIBIB, NICHD, NIMH, NINDS, NINR, OD, OAR, OBSSR, ORWH
[3] This report employs the Institute of Medicine definitions in which sex refers to being male or female based on reproductive organs and functions, and gender refers to a person's "self-representation as male or female, or how that person is responded to by social institutions based on the individual's gender presentation."
[4] Exploring the Biological Contributions to Human Health: Does Sex Matter? Wizemann TM, Pardue M-L, Editors, Committee on Understanding the Biology of Sex and Gender Differences, Board on Health Sciences Policy. Institute of Medicine. National Academy Press, 2001, Washington, DC. p. 17.

evaluation of data: The results obtained can and will prompt the development of practices and policies that stimulate change at the institutional level. Importantly, however, the path toward progress calls for a rational blend of statistics and stories, the latter of which add vital context to this multidimensional problem.

> *Vignette — As a pre-med major at the University of Washington in the 1960s, Shirley Malcom, an Alabama native, found herself a fragile 17-year old moving from an all-Black world to an all-White one, amid the height of the U.S. civil rights movement. Malcom's college advisor was pessimistic that Malcom would be able to attend medical school, citing inadequate grades and insurmountable pressure from male, non-minority applicants. Faced with a pre-college education that did not match those of her non-minority peers, Malcom felt enormous pressure to at once "keep up, but also catch up."*

"If everything is fine, then what's wrong?" Malcom questioned the group.

Over the years, as medical school quotas have disappeared, the number of female trainees in medicine and the sciences has risen sharply, approaching parity in many fields today. But the expectation that the representation of women in these fields would also approach parity — especially at the higher echelons — has not been fulfilled. Although granted entry into professional training, women have faced a male-dominated workforce characterized by ingrained social and cultural structures often unfriendly and/or unfamiliar to women. Moreover, ease of entry has not been accompanied by ease of upward mobility, and starkly low numbers of women hold leadership positions in medicine and science today.

Faculty hiring appears to be a significant pressure point. A combined dilemma of "self-deportation" by women and insufficient recruiting and retention by extant academic leadership leads to lower than expected number of women at the senior level based on the numbers of women in junior and mid-level positions in science and medicine. The distinction between "search" and "sort" in faculty hiring may be particularly germane. The best person for a job may not be looking for that job; thus, intensive outreach is required to find outstanding candidates. Institutional satisfaction for the status quo regarding various factors in faculty hiring and placement may allow disparities to persist by self-limiting the applicant pool. Unintentional "errors of omission" may occur in the case of, in common parlance, the "two-body problem" inherent with dual-career couples. Might the term "two-body opportunity" represent a more creative way to think about this situation?

It is increasingly apparent that bias is a significant factor in setting and maintaining gender inequity in science and medicine. The story of Dr. Ben Barres, a transgender male neuroscientist, is a clear example. Barres was told by peers that he did much better work than his "sister," who in fact was himself years earlier.

Vignette — A recent study[5] showcased dramatically the presence of gender bias in science, reporting that males were significantly more likely than females to be selected among a group of applicants for a scientific position (the fictional applicants were assigned gender-specific names). The researchers observed that "female" applicants scored much lower than "males" in competence, hireability, and mentorability — and they were offered a dramatically lower starting salary. Other experiments with blind review of NSF scientific applications have come to similar conclusions about the reality of unconscious gender bias in science.

Diversity in biomedical and behavioral research is an issue that transcends sex, ethnicity, and race. It has become increasingly evident from a solid foundation of social science research that broad expertise enhances the quality of research. Applying a gender lens places inherent limitations (and in some cases, severe flaws) on research outcomes and the products and policies that result. One flagrant example is the use of male-sized crash-test dummies in automobile safety testing: incorrect technological specifications disproportionately affect the usually smaller female physique.

In December 2011, the National Science Board announced its continued endorsement[6] of the National Science Foundation's (NSF) "Broader Impact" grant-application merit review criterion, which encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes, including enhancing diversity.

Yet, for the most part, the absence of formal structures, policies, and enforcement presents an environment within the sciences that favors the status quo. Unfortunately for women, and also for minorities — women of color face a "double-bind[7]" — presumed incompetence remains a problem. For example, as noted by Betty Vetter, a World-War II Navy meteorologist and later executive director of the Commission on Professionals in Science and Technology, "men are assumed competent until presumed otherwise," but that the opposite is usually true for women.

What are the factors that extend a survival advantage to applicants, regardless of sex? Career choice, and subsequent success, is surely a complicated process that is not solely driven by money, and those determinants remain frustratingly difficult to quantify. Thus, an overreliance on available data — and their inherent limitations and constraints — will restrict progress in overcoming underrepresentation in science and medicine. Thus, despite the fact that the data presented as a result of the NIH-funded Causal Factors and Interventions initiative will provide new understanding and potential corrective actions to be tried, 14 research projects are just the start and it will be important to maintain momentum: both at the NIH, but also at academic institutions nationwide.

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[5] Moss-Racusina, CA et al, Science faculty's subtle gender biases favor male students.
[6] http://www.nsf.gov/nsb/publications/2011/meritreviewcriteria.pdf
[7] Malcom SM, Hall PQ, Brown JW. The Double Bind: The Price of Being a Minority Woman in Science. American Association for the Advancement of Science Office of Opportunities in Science 1515 Massachusetts Avenue, N.W., Washington, D. C. 20005 AAAS Report No. 76-R-3, April 1976.

Presentations and Discussion

Three groups of presentations, representing 1) observational studies; 2) longitudinal studies; and 3) intervention studies; were each followed by a moderated panel discussion. Summaries of these presentations and the ensuing discussions appear below.

1. Observational Studies on Causal Factors

Pivotal Career Decisions Guiding Potential Women Science Faculty

Dr. Rick McGee, Northwestern University Feinberg School of Medicine

Reviewing annual, in-depth interviews from the National Longitudinal Study of Young Life Scientists,[8] this study acquired qualitative data that describes the life experiences and attitudes of women and men starting as juniors in college and progressing through Ph.D. training. The study population of 532 students includes 270 biomedical Ph.D. programs, of which 170 are women with 61 from underrepresented minority (URM) groups along with 31 of the 100 men.[9] The interviews gave students a chance to reflect on scientific trajectories, providing a deep understanding of their varied lived experiences and decision making. Analyses of the interview data combined grounded theory with multiple social science theories and models that investigated concepts including cultural capital, identity, and Communities of Practice.[10] Interviews are ongoing, and continue to provide a glimpse into how gender, race, and ethnicity influence career options and choices for young biomedical scientists.

Findings to date point to discernible patterns for delay to Ph.D. training: Most relate to the development of scientific identity and/or cultural capital of students to see themselves (and be seen by Ph.D.-level program faculty) as legitimate future scientists. In particular:

- Women face more gender-identity challenges/contingencies/biases early in training.
    - Dissociation from femininity
    - Acting overtly feminine to avert "gender-neutral" identity
- Cultural capital (race, gender, and family occupation/education/social background) shapes students' experiences in science training in complex ways.
- Both women and men are concerned with work/life balance in thinking about future careers, and the concerns go beyond issues related to family and children.
    - Other interests, money, location

[8] http://www.bls.gov/nls/

[9] As part of a NIH Pathfinder award, new students may be available for interviews, in addition to the extant study population.

[10] Communities of Practice are formal or informal groups of people who share information and experiences toward personal and professional improvement.

Entry and Retention of Women in the Sciences

Dr. Jennifer Glass, University of Texas, Austin

Gender imbalances in the science, technology, engineering, and mathematics (STEM) workplace persist, despite numerous efforts to rectify the imbalances. Analysis of the 1979 National Longitudinal Survey of Youth college graduate sample,[11] a nationally representative ongoing panel survey of 12,686 young men and women aged 14-22 in 1979 (the tail end of the baby boom), reveals a leaky pipeline with attrition of women during training, at workforce entry, and during career progression. Although the low levels of women in STEM jobs reflects a historical legacy of previous generations, the transition from STEM training to STEM employment appears to be gender-neutral. Interestingly, females who develop a "science identity" as children are more likely to become scientists than men with the same characteristics.

Quite different from entry is retention, however: Women in STEM occupations are significantly more likely to leave their occupational field very early than men in STEM fields or early-career women in other professional careers. STEM women do not leave the labor force entirely, but switch to other fields. Surprisingly, attaining an advanced degree had a negative effect on women's STEM employment retention. Although the status of being married increases exit from the STEM labor force, having a spouse employed in STEM significantly buffers this effect. Gender differences in professional and personal identity are noteworthy: STEM women are more gender-egalitarian on average than college-educated women, whereas STEM men are less gender-egalitarian, on average, than college-educated men. Related to those observations are the effects of family formation on STEM employment retention. Women who expect to remain childless are less likely to leave STEM employment. Similarly, having more than one child has a more pronounced effect on STEM workforce exit compared to other professional fields.

The Influence of Mentoring Upon Career Satisfaction of Male and Female Academic Medical Faculty and the Need for Mentor Networks

Dr. Reshma Jagsi, University of Michigan

The positive role and impact of effective mentoring on trainees in science and medicine has long been recognized. In a similar vein, the absence of mentoring may be associated with faculty discontent and intent to leave academic medicine. Mentoring is a highly heterogeneous activity, and certain characteristics are likely to differ between males and females (both for mentor and mentee). This study sought to determine — through both quantitative and qualitative approaches — which characteristics of mentoring relationships best promote the success and satisfaction of academic medical faculty, particularly women.

[11] http://www.bls.gov/nls/

The study population consisted of trainees in mentored NIH K08 and K23 career development awards between 2006 and 2009. This population was chosen due to its relative homogeneity regarding talent and the criterion of protected research time. Even so, previous studies have shown that even the highly selective population of female K-award recipients is less likely to advance in academic medical careers than are their male peers. Study results indicated:

- Time spent meeting or communicating with a mentor, mentor behaviors, mentor prestige, amount of mentoring received, and collegiality of a mentoring relationship were significantly associated with satisfaction in a multivariable linear regression model. This effect was gender-neutral.
- Mentoring on issues of work-life balance is generally infrequent, even when both members of the mentoring dyad are female.
- The multiple facets of mentoring necessary in academic medicine are best met through interaction with multiple mentors — ideally a mentoring network diverse with regard to area of expertise, professional status level, and sex.

Women and Inclusion in Academic Medicine: An Overview of a Multi-Institutional Study

Dr. Joan Reede and Dr. Emorcia Hill, Harvard Medical School

This interdisciplinary, multi-institutional study[12] sought to clarify the characteristics and interrelationships of institutional, individual, and socio-cultural factors that influence the entry, progression, persistence, and advancement of women faculty, particularly women of color[13] faculty in academic medicine. The research effort included institutions and individuals, and was conducted through data collection, interviews, focus groups, and a web-based survey.

The faculty assessment (web-based survey) revealed a slightly higher proportion of women not seeking promotion, compared to those seeking promotion. Reasons for that choice were varied, and included personal and institutional factors, fatigue, and time commitment. Delving deeper, workplace dissatisfaction issues that may deter women from seeking promotion included:

- Perception of having to work twice as hard as men
- Feeling ignored/not taken seriously
- Perception of being watched more closely
- Feeling isolated
- Perception of being left out of key information networks

Gatekeepers and Gender Schemas

[12] 13 institutions, 3 collaborating sites
[13] African American, Hispanic, American Indian/Alaskan Native, and Asian American

Dr. Elizabeth Travis, University of Texas MD Anderson Cancer Center

How much of the gender imbalance in science and medicine can be attributed to the role of "gatekeepers" that influence decision-making in career-related issues such as hiring? This study examined the potential role of gender schemas in academic advancement, toward the goal of providing future gatekeepers with tools to evaluate candidates more accurately and fairly.

The study analyzed tenure-track searches within two applicant populations (MD Anderson and Rice University), using curricula vitae and letters of recommendation as key metrics. After redacting and coding applications, the study employed a computer text analysis program to examine gender differences in words used to describe candidates. Results indicated that top predictors of getting an interview at both institutions included 1) world rank of graduate and postdoctorate institutions and 2) publishing in top-tier journals. Publication in the most prestigious journals was significantly related to candidate interview and job offer, although the effects were modest (however, note that women have fewer total publications, fewer total citations, a lower h-index,[14] and fewer publications cited 200 or more times). Overall, according to this study, no gender bias significantly affected an applicant's hireability, suggesting that gender schemas do not play a significant role in hiring decisions at the two institutions evaluated.

Educational Pathways to Science and Other Careers for Academically Talented Women

Dr. Claudia Buchmann, Ohio State University

Today, women earn 58 percent of all bachelor's degrees, 60 percent of all master's degrees and half of all professional and doctoral degrees.[15] However, the overall level of gender segregation in the sciences has remained high and appears to be rising.[16] This project assessed the potential relationship between women's slow rates of progress in STEM fields and growing opportunities for obtaining degrees and entering careers that are equally prestigious in other, non-STEM fields.

1) Could it be that women and men differ in their educational goals such that women have stronger preferences for a broader post-secondary education than men? For example, some college majors (education, engineering) have a defined career pathway, whereas career trajectories from other majors are more flexible. This concept was addressed through use of the Gibbs-Martin diversity measure to examine the diversity of coursework taken by women and men within different majors. STEM majors take more courses within their field than any other group of students and thus

[14] H-index is a measure of productivity and impact of the published work of a scientist or scholar
[15] Buchmann C, Di Prete TA. "The Rise of Women"— in press, Russell Sage Foundation
[16] Mann A, DiPrete TA. "Trends in Gender Segregation in the Choice of Science and Engineering Majors," manuscript in preparation

experience considerably less curricular diversity than do non-STEM majors. Among STEM majors, females take a more diverse set of courses, including more humanities and social science courses than males. Broader curricular interests for females than males may help explain the continuing gender gap in STEM majors.

2) Is the popularity of different careers for women related to family-career tradeoffs, specifically the effect of children on wages? Since 1980, women have moved toward parity with men in various professional fields including medicine, law, and business — and have surpassed men in post-secondary education.[17] Gains in STEM fields, however, have lagged. Another study[18] examined the impact of having children on wages — in both male-[19] and female[20]-dominated occupations. Study findings include:

- Since 1980 — when in all occupations but medicine, women experienced a wage penalty for having children — women now experience a wage premium for children in all but business and female-dominated professions.
- By 2010, both women and men enjoyed a parenthood premium in STEM, medicine, and law professions. In law, the size of the wage premium is similar for men and women.
- In STEM and medicine, the parenthood premium is significantly larger for men than women.
- In business and female-dominated professions, the effect of parenthood on wages is significantly different for men and women, as men experience a wage premium in these occupations and women do not.
- In 2010, women in medicine and law far out-earn women in all other occupations, including STEM.

Collectively, this research suggests that the slower growth of women's representation in some STEM professions is due, in part, to growing opportunities in other professions that offer other benefits important to women.

Women in Biomedicine: Jobs and Salaries

Dr. Shulamit Kahn, Boston University

[17] Census data and data from the American Community Survey
[18] McDaniel A, Buchmann C. Penalty or Premium? The Effect of Parenthood on Wages for Men and Women in STEM and Other Elite Occupations, manuscript in preparation
[19] Male-dominated professions: STEM, medicine, law, business, post-secondary education
[20] Female-dominated professions: K-12 education, health, social work

Women's representation in biomedicine (tenure-track academia and industry) is growing, but not tremendously fast. This study[21] analyzed the potential effect of financial compensation: Do biomedical salaries differ significantly for men and women?

The results indicated that female biomedical Ph.D.s earned about 17 percent less than men after controlling for demographics and background factors. However, a large proportion (about 45 percent) of the salary difference disappeared when considering only people working full-time, and the specific employment sector also explained a small amount of the discrepancy.

Interestingly, for women and men working full-time, the results of this study indicated negligible or very small sex differences in starting salaries for women. However, sex differences in salaries grew with work experience, and they were largest in the industry sector. One notable difference in academia was that women were much less likely to hold academic tenure-track jobs in medical schools and more likely to hold non-tenure track academic jobs outside of medical schools.

2. Longitudinal Studies on Causal Factors

Science Faculty Demographics FY 2002 – FY 2012, Quantified by the Nelson Diversity Surveys

Dr. Donna Nelson, University of Oklahoma

The Nelson Surveys describe national faculty demographics in the "top 50" departments in each of 15 science and engineering disciplines.[22] These surveys have been conducted four times over the last 10 years: in FY 2002, FY 2005, FY 2007, FY 2012. Each survey employed the same methodology, which enables a valid comparison of demographics over this 10-year time period. The data (population, not samples), collected from department chairs and disaggregated by race, rank, gender, and disciplines, tallies faculty representation of women, Blacks, Hispanics, and Native Americans. It has been used to assess women's representation in STEM academic pipeline at a point in time, as well as to track the representation of women and URM STEM faculty over time.

From FY 2002 to FY 2012, there has been a modest increase in the numbers of Black (19 to 47) and Hispanic (33 to 76) females in the "quantitative" disciplines;[23] however, there has been a decrease (1 to 0) in the numbers of Native American women in these fields over that time period. The survey data has also been used to assess the field-specific URM attributes such as critical mass, robustness of the pipeline, and utilization of the hiring pool. Collectively, the results indicate:

[21] Using the Survey of Doctorate Recipients (SDR), a biennial panel of biomedical Ph.D.s who received their doctorates between 1980 and 2004; SDR over-samples under-represented groups and women
[22] NSF-ranked by research expenditures
[23] Chemistry, math, computer science, astronomy, physics, engineering

- The social sciences and life sciences each have a good source and critical mass of faculty, but a leaky pipeline.
- Chemistry, math, and computer science have leaky pipelines and no critical mass of faculty.
- The engineering pipeline source is too small, and each sub-group has no critical mass of faculty, but good utilization, nonetheless, of the available hiring pool.

Understanding and Addressing Today's Barriers for Women in Science

Dr. Wendy Williams[24], Cornell University

Today, women who apply for STEM tenure-track professorships in academia are both interviewed and hired at percentages equal to or greater than their numbers in the applicant pool. In addition, women assistant professors without children are, for the most part, paid and promoted comparably to men at comparable institutions. Other academic "success" criteria for women, including manuscript-acceptance and grant-funding rates, are equivalent to those of men.

However, the landscape for young women contemplating an academic STEM career is filled with stark, disconcerting realities. This national empirical research identified extant obstacles limiting women's advancement today, and contrasted current issues from historical ones that have been largely resolved. This analysis revealed:

- Women are less likely to apply for tenure-track positions at research universities, particularly women with children or plans to have children.
- Women who opt out often end up in lower-paying, less prestigious positions with little security and advancement.
- Women graduate students received different mentorship than men regarding career development issues, and this mentorship also varied by mentor gender.
- Professors plan to give different, gender-specific career advice to newly-hired professors in their departments.
- Authorship assignment by professors to graduate students varied for men and women depending on specific circumstances of the collaboration.
- Regarding hiring preferences, women candidates were strongly preferred across natural and social science STEM fields spanning more and less math-intensive aspects.

Then and Now: Are Women and Minority Faculty Better Off?

Dr. Phyllis Carr, Boston University

[24] In absentia, presentation summarized from submitted abstract

Research over the past 20 years has documented inequity in academic advancement for women, especially for women of color. However, in the absence of longitudinal studies of medical school faculty, it remains unclear which individual and institutional factors affect retention and advancement, compensation, productivity, and career satisfaction within academic medicine.

To begin to answer these questions, this large, mixed-methods study builds on the 1995 National Faculty Survey of 1,979 faculty respondents, with a 15-year longitudinal follow-up questionnaire (to 1,373 faculty respondents). This instrument surveyed faculty at one of 24 medical schools in the initial sample. Individual data was enriched with information from public databases on grant funding and publications, and institutional data was enriched with information from both qualitative interviews and the Association of American Medical Colleges' (AAMC) Group on Women in Medicine and Science (GWIMS) and Group on Diversity and Inclusion (GDI). Preliminary findings reveal:

- Problems in the climate for minority faculty, and in retaining URM faculty in academic positions, leading to a void in senior leadership
- Challenges in finding URM faculty using the usual search methods
- Perceptions of an improving climate for women faculty
    - No institutional oversight, varies by department
    - More women in leadership positions
    - Change is often instigated by an individual or group "champion"
- Lack of improvements in the implementation of policies to benefit women, most notably family-leave policies
    - Many faculty did not know their own family-leave policies.
    - Family leave is a personal and gender-neutral issue.
    - Leave policies are not consistently implemented.
- No evidence of federal research grant-funding disparities by sex or ethnic group

3. Intervention Studies on Causal Factors

Women and Academic Medicine: A Randomized Multi-level Trial

Dr. Stephanie Abbuhl, University of Pennsylvania Perelman School of Medicine

Toward the goal of enhancing institutional culture, increasing academic productivity, and improving job satisfaction for women faculty, this cluster-randomized intervention trial targeted junior women faculty,[25] departments and divisions, senior leadership, and workplace culture in 13 randomly assigned departments/divisions (in addition to one control department/division) through a multi-level approach.

[25] women assistant professors

An additional aim was to define and measure organizational "culture," which affects men and women differently and is often so embedded in the workplace as to be unseen.

- Level 1 targeted senior leadership, through qualitative interviews and requested support for carrying out intervention tasks and identified implementation features.
- Level 2 established task forces to identify specific initiatives to improve the environment to better support women faculty (and ultimately, all faculty).
- Level 3 targeted junior women faculty, through manuscript writing groups led by senior women faculty, and hosted professional leadership training by an outside expert.

Analysis of the findings included use of a tool[26] that measured "culture conducive to women's academic success" before and after the intervention. Results demonstrated that:

- Culture scores aligned with satisfaction with and commitment to the faculty member's academic unit.
- Culture scores were correlated within academic units, but differed substantially across academic units.

A summary observation was that while all women experienced increasing work-family conflict with increasing numbers of hours worked, a supportive culture had a protective effect against the negative implications of long work hours on work-family conflict.

Breaking the Bias Habit: A Cluster Randomized Controlled Study of an Educational Intervention in STEMM Departments

Dr. Molly Carnes, University of Wisconsin, Madison

Cultural stereotypes conspire to impede women's participation and advancement in science, technology, engineering, mathematics, and medicine (STEMM). The mere existence of gender stereotypes can lead unintentionally and unwittingly to bias in decision-making in ways that have adverse effects on women in these fields.

This intervention approached the concept of implicit bias as a habit of mind and mobilized behavioral change strategies to remediate such habits in STEMM faculty at one academic institution, the University of Wisconsin, Madison. The intervention matched 92 STEMM departments by size and discipline into 46 pairs randomly selected for intervention or wait-list control. The intervention was a 2.5-hour workshop, "Retaining and Advancing Excellent Faculty Through Bias Literacy," which employed active learning, provided actionable evidence-based bias-reducing strategies, and required

[26] *Academic Medicine* 87(11): 1–10, Nov 2012

faculty to write a commitment to action. Analysis of the results[27] demonstrated that the intervention departments exhibited significant increases in motivation, self-efficacy, and performance of bias-reducing actions. Conclusions from this intervention trial include:

- Implicit gender bias is a root problem impeding women's full participation in STEMM.
- Implicit bias is a habit of mind that can be remediated with intentional behavioral change strategies.
- Reducing the bias habit among faculty is associated with improved department climate.

Ongoing work includes dissemination of "train-the-trainer" materials and analysis of the Study of Faculty Worklife[28] for additional insights on climate, academic productivity, intent to leave, and attrition.

Achieving a Critical Mass of Women Biomedical Faculty: Impact of Three U.S. Programs: Preliminary Findings

Dr. Deborah Helitzer, University of New Mexico School of Medicine

Many women faculty complete career development programs and report changes in attitudes, knowledge, skills, and behaviors. What are the factors and elements of such programs that are effective and might be replicated on various scales? More research is needed to explore associations between program content, participant reports of impact, and outcomes at both the individual and organizational levels.

This study addressed the impact (on promotion and retention, advancement to leadership positions, skills gained and improved, and institutional change) of each of three national career development programs for women faculty on promotion and retention in academic medical institutions: AAMC Mid Career Women in Medicine (MWIM); AAMC Early Career Women in Medicine (EWIM); and Hedwig van Ameringen Executive Leadership in Academic Medicine (ELAM®). These programs differ in length and in focus: The AAMC programs are brief (3-5 days), whereas the ELAM program is a year-long investment. The AAMC programs provide dedicated time to sharpening skills and knowledge necessary for promotion to higher ranks and/or leadership positions. The ELAM program includes additional content on strategic finance, organizational dynamics, personal/ professional leadership development, and a mentored institutional action project. Attendees of both program types uniformly report high levels of satisfaction.

Preliminary findings from the analysis of this study include:

[27] Carnes et al. *J Diversity Higher Educ* 5:63-77, 2012

[28] University of Wisconsin, Madison, climate survey instrument based on interview data from women faculty and staff in STEM disciplines

- Participants from all three programs reported an increase in five skills as a result of program participation: communication, interpersonal skills, leadership, negotiation, and networking.
- Participants of all programs were significantly more likely to become a department chair than women who did not attend a program, as well as being more likely to become a department chair than male colleagues.

Family-Flexible Career Policies as a Strategic Tool to Enhance Academic Careers for Women in Biomedical Sciences

Dr. Amparo Villablanca, University of California, Davis

Balance between career and family continues to challenge academic medical faculty, particularly women, yet effective institutional solutions remain elusive. This study assessed awareness of, access/barriers to, attitudes toward, and use of existing family friendly policies at the University of California, Davis Schools of Medicine, Veterinary Medicine, and College of Biological Sciences. Faculty survey data were analyzed qualitatively and quantitatively for gender, generation, family formation, and career satisfaction before and one year after a multi-pronged communications Accelerator Intervention. Also explored was the degree to which personal and professional characteristics of individual faculty members affect their objective performance during the intervention, their awareness and use of options, and their personal satisfaction. Study findings revealed that:

- Conflicts between work and family-care responsibilities are prevalent.
- Awareness and use of flexibility policies among faculty remain low.
- Multiple perceived barriers to using flexibility policies create cognitive dissonance, especially for young women.
- There is a high level of support for all flexibility policies among all faculty groups.
- The availability of flexibility policies is important to career satisfaction and recruitment/retention, regardless of use.

The results of this study affirm the notion that organizations play a powerful role in shaping faculty perceptions of policy use, but they also highlight the fact that tensions that make policies seem inaccessible may undermine their effective use. Thus, there is a pressing need to translate policy awareness into use, which may grow and sustain momentum for change on a broader scale.

Stanford School of Medicine Office of Diversity and Leadership Strategic Goals: Multifaceted Intervention

Dr. Hannah Valantine, Stanford University School of Medicine

The problem of career attrition among female medical school faculty is remarkable when superimposed on similar data for male medical school faculty. The large gender gap at the full-

professor rank is not likely to disappear on its own and needs urgent attention. Numerous factors play a role in setting and maintaining this disparity; these include both the culture of academic medicine and social/systemic factors that substantiate the status quo.

As one of its strategic goals, the Stanford School of Medicine Office of Diversity and Leadership designed and implemented a multifaceted intervention to enhance recruitment and retention of a diverse faculty, leadership to nurture them, and communication to the local academic community of the value of a diverse faculty. Analysis of the Stanford University Quality of Life survey, along with interviews with URM faculty specifically addressed the issue of retention. While the supportiveness of a faculty member's academic unit and colleagues tended to be key predictors of satisfaction and intention to remain at Stanford, URM faculty — which represent just over 5 percent of all medical school faculty — perceive their colleagues and academic units to be significantly less supportive than faculty of other races and ethnicities. This leads to a common perception among URM faculty of being under-recognized, undervalued, isolated, and marginalized. To address leadership gaps, the intervention sponsored faculty development programs targeted at various faculty career stages. These programs have led to a significant increase in leadership knowledge, confidence, connectedness, sense of empowerment/ability to influence, and sense of workplace community.

To date, Stanford's ability to enhance diversity in its medical school have been promising, but at the current rate of improvement, attaining gender parity will take far longer than desired (28 years at Stanford, 48 years nationwide). Thus, current efforts aim to accelerate the pace of change. A range of strategies are under way, with funding from an array of sources):

- Intervention for implicit bias
- Team science: Education for leadership and effectiveness
- Mitigating stereotype threat (the fear that one's behavior will confirm an existing stereotype of a group with which one identifies)
- Faculty career flexibility
- Sponsorship and networking

Stanford has recently embarked on an intervention to enhance faculty career flexibility: the Academic Biomedical Career Customization (ABCC). This strategy hinges on a team-based career-defining exercise that is fluid, and built from the cooperative contributions of peers on a given team (e.g., in an academic or clinical department that is responsible for a body of work). It tailors an individual's career as priorities change over time. To date, Stanford has piloted the ABCC approach with six departments (one basic science, five clinical); preliminary results suggest increased satisfaction and other positive metrics of short-term success.

Thematic Summary of Presentations and Discussions

Diversity in biomedical and behavioral research is an issue that transcends sex, ethnicity, and race. It has become increasingly evident from a solid foundation of social science research that broad expertise enhances the quality of research, and that all groups benefit from diversity in thought and practice. Although a focus on adequate and appropriate representation in science and medicine is germane to the general issue of scientific and medical diversity, future research studies must address different populations through appropriate "lenses," as well as disaggregate samples as necessary to answer specific research questions.

Building Evidence: Framing Gender Equity as a Scientific Problem

Workshop attendees thanked the NIH for investing research funds toward addressing the important issue of determining causal factors and interventions related to attaining and retaining gender balance in science and medicine. Achieving return on this investment requires scientific rigor in the design, analysis, replication, evaluation, and publication of study data. Dissemination of study outcomes and their potential implications requires effort and must be pursued with vigilance toward changing cultural norms. The NIH can help by encouraging the sharing of findings, resources, and tools, as appropriate.

As with any scientific endeavor, data gathering is an essential activity for testing hypotheses, posing new questions, suggesting interventions, and then testing and evaluating those interventions. Next steps should involve designing multi-faceted, evidence-based interventions, as well as to collect data on the outcomes and impact of such interventions. Key foci include targeting institutional change; incorporating a team-science model (that crosses disciplines and institutions); addressing the full range of career stages and inequities (gender, racial, and other); and adopting flexibility in the traditional definitions of career success.

However, data characteristics and quality must also be considered carefully. The interpretation of results should recognize relevant caveats and limitations. Selection bias is a confounding variable, and may appear in volunteer-reliant surveys and leadership-training interest and enrollment. As one example, the data presented in Beyond Bias and Barriers[29] describes studies limited to U.S. citizens only. Since most foreign scientist trainees are men, these data may overestimate the representation of women in the U.S. science and medical workforce. Workforce-related definitions such as "tenure," "STEM workforce," "productivity," and "success" are highly heterogeneous across institutions and research studies, warranting caution in the interpretation of results. Many measures of success and satisfaction are highly subjective to both sexes.

Importantly, an overreliance on available data — and their inherent limitations and constraints — will restrict progress in achieving gender balance in science and medicine. The path toward progress calls

[29] http://www.nap.edu/catalog.php?record_id=11741

for a rational blend of statistics and stories, the latter of which "add a face and a voice" as well as vital context to the multidimensional problem of underrepresentation.

Data analyses must also look broadly at trends and trajectories, within the context that the science and medicine workforce is a system. It has been noted, for example, that after years of parity, medical school applications from women are on the decline. Monitoring the health and characteristics of the pipeline is necessary for understanding the issue, designing interventions to reverse troubling trends, and for tracking behavior over time. Achieving this goal is fraught with complication, however, due to the constraining nature of existing data sets. For example, the diversity of modern scientific careers that are available and attractive to new graduates has led to measurable declines in academic research accompanied by a concurrent rise in employment elsewhere where scientific training and skills are advantageous. Representation in those areas is less easy to quantify.

Identity is a complex concept that can have positive and negative influences. For youth, being able to visualize one's future self as a scientist/researcher/doctor has been shown to have an effect on future career choice and fulfillment. "Cultural capital" arises from many sources: race, sex/gender, family occupation, education, and social background. These influences play out differently and in various combinations that are not simple to predict or study. They can also be quite negative and learned "on the job." For example, trainees exposed to dissatisfied, fatigued, faculty mentors may become disenfranchised and communicate those feelings to peers, "spreading" such attitudes among social and other networks.

In addition, for many people, identity is not a singular entity. Women of color represent a key example; in the realm of science and medicine, they must manage two significant identities that may each create disadvantages. The "double bind" characteristic of women of color was first described more than three decades ago at a December 1975 conference, the proceedings of which were published by the American Association of the Advancement of Science's Office of Opportunities in Science.[30] As noted in that report:

> "[Women of color] have traditionally been excluded because of biases related to both their race or ethnicity and gender, constituting a double bind. Programs for minorities and women have generally been assumed to include minority women, but in fact minority women fall in the cracks between the two. … It must be noted that several instances were recalled which could have been brought about by race or gender bias or both. When this situation arises it becomes difficult if not impossible to determine which "ism" is in force. In such a case, it does not matter

[30] Malcom SM, Hall PQ, Brown JW. The Double Bind: The Price of Being a Minority Woman in Science. American Association for the Advancement of Science Office of Opportunities in Science 1515 Massachusetts Avenue, N.W., Washington, D. C. 20005 AAAS Report No. 76-R-3, April 1976, pages 1-3.

> whether one is being hit with the club of sexism or racism — they both hurt. And this is the nature and the essence of the double bind."

Managing multiple identities can be difficult, confusing, and exhausting —all of which potentially take away from professional and personal satisfaction. Toward understanding specific issues related to different groups — of which one person may belong to two or more — data disaggregation is paramount. Populations are heterogeneous, and thus studies to examine sex/gender, racial, ethnic, and field-specific contributions to various issues must be carefully designed and interpreted so as not to generate averaged findings. This concern is especially important in designing and testing interventions.

For many/most careers, financial compensation is a tangible metric of success. Sex differences in salary within the sciences continue to be a persistent disparity, in particular for women "at the top." Studies have shown that when confounding factors are removed from analyses — such as child-bearing and negotiation skills — for women in science, experience does not translate into financial rewards at the same rate as it does for men in the same fields. Sex-based salary disparities are most pronounced in the scientific/medical industry sector.

Transferring Knowledge to Practice

Bias is defined as possessing one perspective at the expense of another. In contrast to explicit (known) bias, implicit bias is unintentional and often unrecognized. Whereas efforts to achieve gender balance have mostly identified — and have tried to dispel — sources of explicit bias, erasing implicit bias has proven to be a much more difficult task. That is because many people — women and men alike — do not even recognize the presence of implicit bias in the attitudes and actions of themselves or others.

Bias is a significant factor in setting and maintaining gender inequity in science and medicine. Encouragingly, studies have shown that it is possible to mitigate implicit bias through training, and that people are often eager to engage in this activity that helps themselves and others. With regard to gender balance in science and medicine, small, single-institution studies have shown the efficacy of bias training on reducing bias, but these studies have yet to show that reducing bias has concrete effects on other metrics, such as work productivity. If and when those connections can be drawn, senior institutional leadership will likely be inspired to implement bias training locally.

Addressing the causes of gender underrepresentation (and those attributed to racial, ethnic, and other affiliations) will not be achieved by one-size-fits-all solutions. Changing culture requires enforceable policies targeted to both individuals and to institutions (academic units and structures as well as the NIH and broader scientific/medical communities). Currently, the absence of formal structures, policies, and enforcement presents an environment that tends to preserve the status quo, and often entrenches outdated and/or unfair behaviors (many of which may be unconscious). Many practices

and policies are unwritten, making them hard to follow and even harder to change. Career progression — hiring, tenure, and promotion — is one area where fresh approaches could be employed. While it is true that many institutions have or are planning to abandon the concept of tenure, there remain many unwritten rules and informal practices that govern career advancement. The concept of "search instead of sort" represents the notion that finding candidates for position should be a proactive process that goes beyond the standard criteria of inviting only those who apply.

An anthropological concept, a Community of Practice represents a group of people who share an interest or a profession, and who also share knowledge, resources, and tools. Such groups may be quite informal, and they facilitate learning and feelings of professional belonging. Encouraging the formation of such groups may prompt rule-setting and rule-enforcement. Within such organizational structures, early adopters lead to early successes, and change occurs in small units that build over time. Because "all interventions are local," the concept of communities of practice is especially important in dissemination and implementation of solutions. However, larger groups, such as the NIH and professional societies, can help by offering resources and vehicles that individual localities can employ as appropriate to their unique environments. Sharing of best practices leverages these efforts and contributes toward broader societal cultural change.

Achieving Cultural Change

The growing body of research on causal factors of sex/gender and other inequity in science and medicine coincides with other ongoing shifts in these professional areas. Increasingly evident is the need for convergence, among fields and between researchers. The age of interdisciplinarity is here, and it presents an opportunity to justify the value of all types of diversity. Change is often difficult, especially within institutions that retain traditions and structures that are "siloed," and represent division not inclusion. The NIH should lead by example to "de-silo" issues that resonate across disciplines. The workforce is certainly one such issue, especially since data suggests that the cultural environment is a mediator for success. A positive environment can buffer the challenging but universal effects felt by nearly all members of a given profession, regardless of sex, race, or ethnicity.

To date, improving the workforce climate for women (and/or for underrepresented groups) has more often than not been initiated, nurtured, and executed by a "champion" for either an individual or for a particular group. While this strategy can be very powerful, it is neither efficient nor scalable. Regarding institutional attitudes, practices, and policies, such as those related to recruiting and retaining a diverse student body/faculty, leadership must start at the top. Senior leaders "set the tone," and if effective, follow through with rewards or punishment for those who violate the principles established. Because of this reality, research findings that provide evidence for strategies that increase diversity and inclusion must obtain buy-in from the stage of research idea to that of implementation program. As noted earlier, both data and stories serve as important ingredients for fostering change.

The consensus is clear that mentoring serves far more than a supervisory role. Certainly, "A mentor cannot be all things to all people," and thus there is significant value in mentor networks. Such "assemblies" should be tailored for an individual's needs, by the individual, and should consist of people at various levels. Peers can offer unique support, as can senior scientists that offer the wisdom of experience, as well as the gift of sponsorship — putting forth a mentee for key positions and casting the mentee in a good light for future opportunities. This proactive activity has traditionally been a cornerstone of male advancement in the sciences and in other professions, but women, on average, could do more to recognize and participate actively in sponsorship. It can provide a pathway to those "gatekeepers" that make hiring and promotion decisions.

A key aspect of mentoring is help with career planning, but individuals should mainly own this task. Creating and maintaining individual development plans (IDPs) has been a key part of most industries for many years, and the value of IDPs appears to be catching on in science and medicine. Many professional scientific and medical societies offer tools for creating these useful "living" documents. Also outside of the traditional mentor-mentee dyad is skill-building that can be acquired through leadership courses, or as well through more informal settings such as dinners, seminar series, and other recurring events that draw women together to discuss opportunities and challenges, and to trade strategies for success.

Work-Life Balance: Establishing a Healthy Climate

The saying goes, "If you know one institution, you know one institution." Flexibility policies vary widely throughout the range of workplaces where scientists and physicians work. Recent analyses are uncovering the fact that even established and generous flexibility policies often are not well-recognized and hence underused. Moreover, cultural resistance to refrain from using flexibility policies is ingrained within both women and men in academia. Some of the reasons include fear of retribution in the form of offers going to other people, the difficulty of playing "catch-up" upon return to work, a perception that favors to colleagues are necessary to even the playing field. Institutions should consider implementing "opt-out" flexibility policies rather than those that require faculty to "opt in" and expressly choose to participate.

Importantly, flexibility policies address work-life balance beyond children and parenting. Increasingly, scientists want to pursue additional facets of life and seek an environment that makes this possible. As such, people make a conscious decision not to seek a tenure-track position, or the power and prestige of a department chair. Cultural change is still needed to recognize the value and contributions of various career choices within science and medicine. One area needing attention and further study in particular is the dissonance of gender roles in STEM compared to other professional areas — this fairly unique situation calls for different strategies for engaging women and men in matters related to work-life balance, family roles in particular.

Conclusion

This workshop, reflecting the first results of funding from the NIH-sponsored RFA, "Research on Causal Factors and Interventions that Promote and Support the Careers of Women in Biomedical and Behavioral Science and Engineering," presented a growing body of research focused on understanding — and learning how to address through interventions — differences in rates of progression of men and women in science and medicine careers.

The focus on data collection and analysis that undergirds this agency-wide initiative provides the opportunity for both the NIH and the wider scientific community to better understand the drivers that affect the representation of women at various career levels in the science and medical workforce, as well as to point to additional testable interventions to address trends of underrepresentation.

Findings presented at this meeting, while focused primarily on the representation of women in science and medicine, are relevant to the general issue of scientific and medical diversity. The NIH will carefully consider the results of these and related research studies toward addressing the underrepresentation of women in biomedical and behavioral research.

APPENDIX I: AGENDA

Thursday, November 8, 2012

7:45 a.m.	**Registration**
8:15–8:30 a.m.	**Welcome and Introductions** **Judith Greenberg, Ph.D.,** Acting Director, National Institute of General Medical Sciences, NIH **Janine A. Clayton, M.D.,** Associate Director for Research on Women's Health and Director, Office of Research on Women's Health, NIH **Molly Carnes, M.D., M.S.,** University of Wisconsin–Madison, Co-chair **Joan Reede, M.D., M.P.H., M.S., M.B.A.,** Harvard Medical School, Co-chair
8:30–9:15 a.m.	**Keynote Address** **Shirley Malcom, Ph.D.,** American Association for the Advancement of Science
9:15–10:45 a.m.	**Panel 1** **Richard McGee*[31], Ph.D.,** Northwestern University *Pivotal Career Decisions Guiding Potential Women Science Faculty* **Donna Nelson*, Ph.D.,** University of Oklahoma *Building an Evidence Base for Developing Effective Intervention Strategies for Women* **Joan Reede*, M.D., M.P.H., M.S., M.B.A.,** and **Emorcia V. Hill*, Ph.D.,** Harvard Medical School *Factors that Promote and Support Careers of Women of Color in Academic Medicine* **Virginia Valian*, Ph.D.,** Hunter College, **Elizabeth Travis*, Ph.D.,** MD Anderson Cancer Center, **Michelle R. Hebl,** Rice University, and **Randi C. Martin, Ph.D.,** Rice University *Gatekeepers and Gender Schemas*
10:45–11:00 a.m.	**BREAK**
11:00–11:30 a.m.	**Discussion of Panel 1** **Moderator: Susan Shurin, M.D.,** National Heart, Lung, and Blood Institute

[31] * = presenter

11:30 a.m.–12:30 p.m.	**LUNCH**
12:30–2:15 p.m.	**Panel 2**

Thomas DiPrete, Ph.D., Columbia University, and **Claudia Buchmann*, Ph.D**., The Ohio State University
Educational Pathways to Science and Other Careers for Academically Talented Women

Karen Freund, M.D., M.P.H., Tufts University School of Medicine, and **Phyllis Carr*, M.D.,** Boston University Medical Campus
Longitudinal Follow-up of the National Faculty Survey: What Factors Predict Academic Success and Career Satisfaction?

Donna K. Ginther, Ph.D., University of Kansas, and **Shulamit Kahn*, Ph.D.,** Boston University
Economic Explanations for Gender Differences in Biomedical Careers

Reshma Jagsi*, M.D., D.Phil., University of Michigan at Ann Arbor
Examining How Gender Differences in Outcomes Develop Among Physician Researchers

Yael M. Levitte, Ph.D., Cornell University, **Jennifer L. Glass*, Ph.D.,** University of Texas at Austin, and **Sharon L. Sassler, Ph.D.,** Cornell University
Entry and Retention of Women in the Sciences: A Cohort Comparison

2:15–2:30 p.m.	**BREAK**
2:30–3:00 p.m.	**Discussion of Panel 2** **Moderator: Belinda Seto, Ph.D.,** National Institute of Biomedical Imaging and Bioengineering
3:00–4:45 p.m.	**Panel 3**

Stephanie B. Abbuhl*, M.D., FACEP, and **Jeane Ann Grisso*, M.D., M.S.C.E.,** University of Pennsylvania
Women & Academic Medicine: A Randomized Multi-level Trial

Molly Carnes*, M.D., M.S., University of Wisconsin–Madison
Advancement of Women in STEMM: A Multi-level Research and Action Project

Deborah L. Helitzer*, Sc.D., University of New Mexico
Achieving a Critical Mass of Women Biomedical Faculty: Impact of Three U.S. Programs

Amparo Villablanca*, M.D., and **Lydia P. Howell, M.D.,** University of California, Davis
Women's Careers in the Medical Sciences and Family Friendly Policies

Wendy M. Williams*, Ph.D., M.S., Cornell University
Assessing and Reducing Gender Bias in STEM Recruitment, Mentorship and Evaluation

4:45–5:15 p.m. **Discussion of Panel 3**
Moderator: Yvonne Maddox, Ph.D., *Eunice Kennedy Shriver* National Institute of Child Health & Human Development

5:15 p.m. **Adjourn**

Friday, November 9, 2012

8:30–9:30 a.m. **Recap of Day 1**
Hannah Valantine, M.D., Stanford University

9:30–11:30 a.m. **Discussion**
Co-chairs and participants

11:30 a.m. **Adjourn**

APPENDIX 2: ROSTER

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