



NATIONAL INSTITUTES OF HEALTH

**REPORT OF THE
ADVISORY COMMITTEE
ON RESEARCH ON
WOMEN'S HEALTH**

FISCAL YEARS 2013–2014

Office of Research on Women's Health and
NIH Support for Research on Women's Health



National Institutes of Health
Office of Research on Women's Health

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Table of Contents

Letter from the ORWH Director.....	iv
Preface	vii
Advisory Committee on Research on Women’s Health, FY 2015.....	viii
Organization of the FY 2013–FY 2014 Report of the Advisory Committee on Research on Women’s Health	ix
Report of the Office of Research on Women’s Health	x
I. ORWH Background	1
A Historical Perspective: The Development of the Office of Research on Women’s Health	1
NIH Strategic Plan for Women’s Health Research and Emerging Strategic Priorities.....	2
II. ORWH Research	7
Introduction	7
ORWH Programs to Advance Women’s Health Research and Understanding of the Influence of Sex and Gender on Health and Disease.....	9
ORWH Cofunding with ICs in Targeted Research Areas	12
ORWH Research Dissemination Activities	14
Research Meetings, Conferences, and Workshops	14
III. ORWH Biomedical Career Development Activities	19
Building Interdisciplinary Research Careers in Women’s Health (BIRCWH)	19
Women’s Reproductive Health Research (WRHR) Career Development Program	26
Research Supplements to Promote Reentry into Biomedical and Behavioral Research Careers....	28
NIH Working Group on Women in Biomedical Careers.....	28
NIH Intramural Program on Research on Women’s Health (IPRWH)	31
ORWH Support for Other NIH Career Development Programs and Activities	32
Summary: Biomedical Career Development Program Activities Support the Implementation of the NIH Strategic Plan for Women’s Health Research.....	34
IV. Monitoring Adherence to the NIH Policy on the Inclusion of Women and Minorities as Subjects in Clinical Research	37
Historical Perspective	37
Inclusion Monitoring Activities.....	38

NIH Efforts to Re-Engineer Inclusion Business Processes and Procedures	39
Summary Report of NIH Inclusion Data: Comparison of FY 2013 and FY 2014 and Trend Data	40
ORWH Activities Related to NIH Inclusion Policies and Reporting	55
V. NIH Budget for Women’s Health Research.....	59
NIH Budgetary Expenditures for Research on Women’s Health, FY 2013 and FY 2014	59
Report of the NIH Institutes and Centers.....	68
National Cancer Institute	70
National Eye Institute	89
National Heart, Lung, and Blood Institute	93
National Institute on Aging	106
National Institute on Alcohol Abuse and Alcoholism	116
National Institute of Allergy and Infectious Diseases	122
National Institute of Arthritis and Musculoskeletal and Skin Diseases	144
National Institute of Biomedical Imaging and Bioengineering	158
<i>Eunice Kennedy Shriver</i> National Institute of Child Health and Human Development	167
National Institute on Deafness and Other Communication Disorders.....	183
National Institute of Dental and Craniofacial Research.....	187
National Institute of Diabetes and Digestive and Kidney Diseases	202
National Institute on Drug Abuse	221
National Institute of Environmental Health Sciences.....	240
National Institute of General Medical Sciences	251
National Institute of Mental Health	256
National Institute on Minority Health and Health Disparities	269
National Institute of Neurological Disorders and Stroke	277
National Institute of Nursing Research	287
Fogarty International Center	299
National Center for Complementary and Integrative Health	307
Office of Research Infrastructure Programs.....	310
Office of Strategic Coordination (NIH Common Fund).....	328
Index.....	331

Letter from the ORWH Director

I am honored to share with you the many accomplishments in this fiscal year (FY) 2013–FY 2014 biennial report. This report bears witness to the phenomenal growth in women’s health research and related programs over the past 2 years. It reflects major ORWH research programs, initiatives, and activities, as well as research highlights from NIH Institutes and Centers and program offices. Chief among these developments is a policy shift, announced in May 2014, that will ensure the study of both sexes in NIH-funded preclinical research. This is sure to inspire a transformation in the way science is done and will go a long way toward improving the health of women and men.

When we talk about how biomedical research can benefit women and diverse populations, immense credit must go to Congress’ vision in enacting the NIH Revitalization Act of 1993, which mandated the inclusion of women and minorities in NIH clinical research. Two decades later, more than half of participants in NIH-funded clinical trials are women. Enrolling women in clinical research has paid dividends for millions of Americans, as we learned that conditions such as heart disease, the number one killer of both men and women, can appear differently in women, with symptoms that could be ignored without this knowledge. We also learned that certain drugs, such as aspirin, zolpidem, and antihistamines, can have different effects on women than on men. But there is more that we need to do.

Standing on the shoulders of the groundbreaking change that followed enactment of the 1993 law is the 2014 announcement that NIH will require scientists to take sex into account in preclinical research. This deliberate approach aims to create a more fluid connection between clinical research, which is research done on humans, and preclinical studies that employ animals and cells as models for human disease. Preclinical research is a crucial area of discovery that precedes the development of more expensive, higher-risk clinical studies that enroll human subjects.

Sex is a fundamental variable in biomedical research that must be considered from the very start of the scientific process. Considering the influence of sex in preclinical research will yield findings that better inform our clinical studies, ensuring that men and women get the full benefit of medical research. Copious evidence shows that research that considers sex is rigorous and powerful, and it can lead to discoveries that allow us to deliver person-centered care appropriate to each American. Taking sex into account is a key turn on the road toward precision medicine.

We are calling for this paradigm shift in medicine based on today’s knowledge and understanding. Being male or female is a critical determinant of health. Health care providers must choose the best treatment in the context of every individual patient. Optimal treatments can differ by sex, affecting outcomes for men and women. Delivering customized clinical care for men and women alike is within our grasp.

Studying both sexes also strengthens science. Publicly funded biomedical research must adhere to high standards, one of which is the guiding principle to take sex into account as a fundamental variable. Incomplete study of both sexes and failure to specify the sex used in experiments affect our ability to verify and duplicate results. By requiring that scientists take sex into account in preclinical research, NIH is funding the highest-quality science.

Transforming science is not a solitary pursuit. NIH needs all stakeholders to be a part of the solution. It is working with journal editors, publishers, medical schools, and professional and scientific societies to emphasize the importance of including sex-specific data in publications, curricula, and conferences.

It is a tremendously exciting era for science, and all Americans should have the opportunity to participate in the amazing pursuit of knowledge for improved health. ORWH is working to make sure that women have access to opportunities in research and medicine. We know from seminal work in the behavioral and social sciences that diversity promotes synergy and excellence, paving the way for the inventive problem solving that has been a proud hallmark of America's investments in biomedical research. Promoting the recruitment, retention, reentry, and advancement of women in biomedical careers is a vital aspect of the ORWH mission and is critical in strengthening the scientific workforce that will develop the scientific breakthroughs of the 21st century.

Thank you for the opportunity to share this exciting new chapter in the story of research on women's health at NIH. We are committed to improving the health of women, and we recognize the importance of all stages of the research process in contributing to that goal. I hope that this report enhances your appreciation of the value of studying both sexes in health and disease to deliver customized clinical care to improve the health of women and men.

Janine A. Clayton, M.D.

Associate Director for Research on Women's Health

Director, Office of Research on Women's Health

National Institutes of Health

August 2015





Preface

The members of the Advisory Committee on Research on Women's Health (ACRWH) are pleased to submit to the National Institutes of Health (NIH) Director, through the Associate Director of Research on Women's Health, the **Report of the Advisory Committee on Research on Women's Health for Fiscal Years 2013 and 2014**.

This biennial report details the NIH-wide programs and accomplishments carried out in fulfillment of the Office of Research on Women's Health's (ORWH's) core mission, as outlined in the NIH Revitalization Act of 1993 (Public Law 103-43, Section 486B). That mission is to strengthen and enhance NIH basic, translational, and clinical research:

- **To increase the understanding of the diseases and conditions that affect women, including investigation and elucidation of the role of sex and gender factors in health and disease;**
- **To build NIH programs to develop a cadre of researchers, both women and men, who are trained to conduct interdisciplinary research in these areas;**
- **To ensure the appropriate representation of women in NIH research; and**
- **To support the advancement of women in biomedical careers.**

The members of the ACRWH have reviewed the information in this biennial report and find that it reflects the breadth and depth of research, programs, and related activities through which ORWH has achieved its mission in fiscal year (FY) 2013 and FY 2014. The report also provides highlights from research on women's health and on the

influence of sex and gender on health and disease supported by NIH Institutes and Centers (ICs) and program offices within the Division of Program Coordination, Planning, and Strategic Initiatives in the NIH Office of the Director. In addition, the report presents information on NIH budget allocations for women's health research during FY 2013 and FY 2014 by using information supplied by the U.S. Department of Health and Human Services' Office of the Assistant Secretary for Financial Resources. Finally, the report documents the inclusion of women and minorities in NIH-funded clinical research during these years.

ORWH is the first U.S. Public Health Service office dedicated specifically to promoting women's health research within and beyond the NIH scientific community. Thus, the ACRWH recognizes the pivotal role that the ORWH Director plays in guiding the office's progress toward facilitating, encouraging, and executing a myriad of NIH-wide accomplishments in support of its mission. The ACRWH wishes to acknowledge the work of the Coordinating Committee on Research on Women's Health, which compiled, summarized, and submitted many exciting highlights of the wealth of research on women's health and on the influence of sex and gender on health and disease, which appear in this report. Finally, the ACRWH acknowledges the ORWH staff who meet the mandates underlying the office's establishment by providing leadership, both within NIH and with the extramural research community, to accomplish the many outstanding and important advances in NIH-funded science and in career support that this report describes.

Advisory Committee on Research on Women's Health, FY 2015

See Appendix A for a list of committee members for FY 2013 and FY 2014.

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Organization of the FY 2013–FY 2014 Report of the Advisory Committee on Research on Women’s Health

This report reflects the extraordinary progress made in women’s health research and related programs since ORWH was formed in 1990. It describes major ORWH research programs, initiatives, and activities and highlights from the NIH ICs and program offices. This report is not a comprehensive listing of all NIH research on women’s health, which would necessarily be encyclopedic, but it summarizes, under a single cover, examples of the wealth of NIH advances in women’s health research.

This report is divided into two major parts. Part 1 presents ORWH programs, and Part 2 provides individual reports on women’s health research from the NIH ICs and program offices in the NIH Office of the Director. **Part 1** is organized into the following five sections:

- I. ORWH Background
- II. ORWH Research
- III. ORWH Biomedical Career Development Activities
- IV. Monitoring Adherence to the NIH Policy on the Inclusion of Women and Minorities as Subjects in Clinical Research
- V. NIH Budget for Women’s Health Research

Section I: ORWH Background describes ORWH’s development and mission. It also provides an overview of the NIH Strategic Plan for Women’s Health Research.

Section II: ORWH Research provides an overview of Office activities and programs in response to the mandate to strengthen and enhance research on women’s health and on the influence of sex and gender on health and disease. It describes the role that ORWH plays in integrating sex and gender perspectives into all NIH IC research and how ORWH leverages funding to increase support for research in targeted areas of its mission.

Section III: ORWH Biomedical Career Development Activities describes activities and programs in response to the mandate to improve the advancement of women in biomedical careers and to increase the number of researchers focused on women’s health research. It describes programs used to train and mentor junior faculty in women’s health research topics and a number of other programs and activities that promote women’s biomedical careers, facilitate reentry of women and men into the biomedical workforce after an extended absence, and provide training and workforce development opportunities.

Section IV: Monitoring Adherence to the NIH Policy on the Inclusion of Women and Minorities as Subjects in Clinical Research provides an overview of activities and programs in response to the mandate to monitor the inclusion of women and minorities in NIH-funded clinical research. It includes aggregate data on the numbers of women, men, and minorities who participated in this research.

Section V: NIH Budget for Women’s Health Research provides information on NIH expenditures on women’s health research, including a breakdown of the expenditures by disease category and other major categories of interest.

Part 2 of the biennial report consists of individual reports that summarize NIH ICs’ and program offices’ major initiatives and activities and provide highlights of the research each has funded related to women’s health and the influence of sex and gender on health and disease, consistent with their specific missions.

The biennial report appendices are available online at orwh.od.nih.gov.





REPORT OF THE
OFFICE OF RESEARCH
ON WOMEN'S HEALTH



I. ORWH Background

A Historical Perspective: The Development of the Office of Research on Women's Health

In 1983, Assistant Secretary for Health Dr. Edward N. Brandt, Jr., established the U.S. Public Health Service Task Force on Women's Health Issues in recognition of the paucity of data related to women's health. In 1985, the task force produced a report, "Women's Health: Report of the Public Health Service Task Force on Women's Health Issues, Volume I," calling for an expansion of biomedical and behavioral research on conditions and diseases unique to, or more prevalent in, women in all age groups (U.S. Public Health Service, 1985). In 1986, NIH published a policy that "urged" the inclusion of women in NIH clinical research (NIH, 1986a; NIH, 1986b). Shortly thereafter, NIH published another policy, this time encouraging the inclusion of minorities in clinical studies (NIH, 1987).

In 1990, the Congressional Caucus for Women's Issues asked the General Accounting Office, now known as the Government Accountability Office, to investigate the implementation of the guidelines for including women in NIH-funded clinical research. The resulting report, included in congressional testimony, indicated that the policy's implementation was slow and not well communicated, that gender analysis was not performed routinely, and that the impact of the policy could not be determined (National Institutes of Health: Problems in Implementing Policy, 1990). These findings catalyzed the 1990 establishment of ORWH within the NIH Office of the Director; the NIH Revitalization Act of 1993 established the Office in statute. In that act, Congress assigned a far-reaching leadership role for ORWH by mandating that its Director:

1. Advise the NIH Director and staff on matters relating to research on women's health;
2. Strengthen and enhance research related to diseases, disorders, and conditions that affect women;
3. Ensure that research conducted and supported by NIH adequately addresses issues regarding women's health;

4. Ensure that women are appropriately represented in biomedical and biobehavioral research studies supported by NIH;
5. Develop opportunities and support for recruitment, retention, reentry, and advancement of women in biomedical careers; and
6. Support research on women's health issues.

The NIH Revitalization Act also established two committees to help ORWH fulfill its mission. The Advisory Committee on Research on Women's Health (ACRWH), composed of non-Federal members, provides the ORWH Director with a ready source of expert, outside advice and recommendations on women's health research issues. ACRWH members are chosen from among leading research scientists, health practitioners, advocates, educators, and other professionals.

A trans-NIH committee, the Coordinating Committee on Research on Women's Health (CCRWH), also provides advice and recommendations to the ORWH Director. CCRWH is composed of Directors, or their designees, from NIH ICs and offices in the Office of the Director who act as direct liaisons between ORWH and the ICs.

In 2006, the NIH Reform Act called for a reorganization of the Office of the Director. ORWH was placed in the new Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI), whose responsibilities included developing and guiding major trans-NIH initiatives. This placement of ORWH within DPCPSI highlighted and facilitated the Office's role as NIH's focal point for women's health research. However, the 2006 legislation did not change the Office's statutory responsibilities.

The mission statement of ORWH continues to emphasize its historic role in improving women's health through research, including women in clinical research, and promoting women in biomedical careers. The mission statement also emphasizes the contribution of research on health and disease that takes sex and gender into account. ORWH is also focusing on other key areas, including interdisciplinary research and training, and on research to understand the causes of health disparities among different populations of

women, defined by factors such as socioeconomic, age, and racial and ethnic group membership.

Within DPCPSI, ORWH has worked to strengthen its role as the focal point for women's health research at NIH by working with ICs as a full scientific partner to ensure that the broad NIH scientific framework incorporates research relevant to women's health. In this work, ORWH is guided by the goals, objectives, and cross-cutting themes within the NIH Strategic Plan "Moving into the Future with New Dimensions and Strategies: A Vision for 2020 for Women's Health Research" (ORWH, NIH, HHS, 2010a).

NIH Strategic Plan for Women's Health Research and Emerging Strategic Priorities

Guiding Tomorrow's Research on Women's Health

In September 2010, ORWH released the third NIH scientific agenda for women's health, titled "Moving into the Future with New Dimensions and Strategies: A Vision for 2020 for Women's Health Research" (ORWH, NIH, HHS, 2010a; ORWH, NIH, HHS, 2010b; ORWH, NIH, HHS, 2010c). This research agenda was the culmination of a highly interactive scientific and public partnership that looked back for historical perspectives and forward to new research opportunities on the horizon. The resulting three volumes—an executive summary, reports from regional scientific workshops, and public testimony—represent

the NIH Strategic Plan for Research on Women's Health for 2010–2020. They serve as a framework for research investigations galvanized by cutting-edge technologies and nascent scientific concepts to advance women's health research through interdisciplinary and multidisciplinary collaborations across the entire research spectrum, from basic to clinical and translational (Pinn, Clayton, Begg, & Sass, 2010). This framework guides all ORWH activity, ensuring that the Office allocates resources to capitalize on key opportunities for advancing scientific research and career objectives.

The research agenda comprises the following six cross-cutting goals, each containing several objectives:

1. Increase the study of sex differences in basic biomedical and behavioral research.
2. Incorporate findings of sex differences in the design of new technologies, medical devices, and therapeutic drugs.
3. Actualize personalized prevention, diagnostics, and therapeutics for women and girls.
4. Create strategic alliances and partnerships to maximize the domestic and global impact of women's health research.
5. Achieve a clearer and wider understanding of women's health issues through strategic communications of research findings to diverse audiences.
6. Employ innovative strategies to build a well-trained, diverse, and vigorous women's health research workforce.

Read the entire strategic plan at <http://orwh.od.nih.gov/research/strategicplan/index.asp>.

The mission statement of ORWH continues to emphasize its historic role in improving women's health through research.





Next Steps in Strategic Planning: Moving Forward with New Policy to Ensure Consideration of Sex in Preclinical Research

As expected and intended, development of “Moving into the Future with New Dimensions and Strategies: A Vision for 2020 for Women’s Health Research” pointed to gaps in the foundation of knowledge about women’s health. Particularly striking was the lack of information about female biology, physiology, and pathology from preclinical research. In 2015, NIH is establishing new policies aiming to remedy this lack of information.

In 2015, although we have made major progress in human studies—women now account for roughly half of the participants in NIH-funded clinical trials—we have not seen a similar pattern in preclinical research. Animal studies have often focused on males, and investigators studying cell models have often ignored the sex of the individual from which the cells were obtained. For the most part, biomedical research has not looked for differences between males and females, leaving gaps in our knowledge. As a result of a [May 2014 report in *Nature*](#) from ORWH Director Dr. Janine Clayton and NIH Director Dr. Francis Collins, ORWH collaborated with the Office of Extramural

Research (OER) to ensure that NIH-funded research will now purposefully address both female and male biology.

Beginning in January 2016, NIH-funded scientists will be required to account for the possible role of sex as a biological variable (SABV) in vertebrate animal and human studies (See [NIH Guide Notice NOT-OD-15-002](#)). ORWH has been actively involved in implementing this policy across NIH and with agency stakeholders. Upon approval from the Office of Management and Budget, OER will update instructions for applicants as part of NIH’s efforts to enhance reproducibility through rigor and transparency. Applicants will be asked to include SABV information in the Research Strategy section of applications, and study sections will review this information.

Preclinical research conducted in animals is designed to pave a potential path for human studies; thus, studying both sexes is essential for ensuring the relevance of findings. Although all animal models are not the same, studying both sexes is a guiding principle for any research that bears on health for human females and human males. Appropriate strategies for considering SABV depend on the context of the research question at hand and existing understanding of sex influences. In summary, all preclinical studies should map back to the basic concept that key biological variables

such as sex need to be considered from hypothesis to publication.

ORWH is acting on other fronts to ensure that we learn more about sex-based influences on biological systems. In FY 2013, ORWH launched an initiative (PA-13-018) that provides funding supplements to existing NIH grants

to add subjects, tissues, or cells of the sex not included in the original grant, or to increase the power of a study to analyze sex or gender differences by adding more subjects of either sex to a sample that already includes both males and females.

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II. ORWH Research

Introduction

Research Mission

The research mission of ORWH is to foster, guide, and support research on women's health and the influence of sex and gender on health and disease. ORWH works in partnership with NIH ICs and the extramural scientific community to ensure that sex and gender perspectives are integrated into the scientific framework of all biomedical research funded by NIH. The NIH Strategic Plan for Women's Health Research provides guidance to NIH ICs and extramural investigators on research areas of significant interest to the mission of ORWH.

ORWH is in a unique position to leverage research investments and cofunding dollars to encourage new approaches, novel methods, and key questions that will drive the research of all fields toward an understanding of the biology of male and female subjects. In turn, such research can serve as a foundation of knowledge to build on in every area of biomedical science. Since ORWH was established in 1993, its investments in research programs to stimulate the field of women's health had a substantial impact on guiding the curating of a wealth of knowledge about the specifics of women's health research.

A need to consider sex as a biological variable in research design was highlighted in the 2010 NIH Strategic Plan for Women's Health Research. That plan had noted a dearth of research knowledge on the influence of sex as a biological variable in many clinical areas. The plan further identified preclinical research, a major source of translational hypotheses, as an area in which reporting of findings by sex was insufficient to generate appropriate hypotheses for both men and women.

Shifting the Focus

In 2014, ORWH Director Dr. Janine Clayton and NIH Director Dr. Francis Collins called for NIH to address an imbalance in preclinical studies whose findings were often based on animals of only one sex, typically males. They noted that an overreliance on male animals may obscure key sex differences that could guide clinical studies.

In their paper, Dr. Clayton and Dr. Collins also called for policy changes to encourage NIH-funded researchers to consider sex as a biological variable (SABV) in the design of their studies and in the analysis and reporting of their findings. Accordingly, in 2015, NIH is taking steps to ensure that NIH-funded research routinely includes vertebrate animals of both sexes in preclinical research.

ORWH: Driving the NIH Women's Health Research Agenda

Today, ORWH programs emphasize the need for broad-scale biomedical research on males and females not only to identify sex or gender differences in disease presentation but also to understand whether they lead to differences in the efficacy and safety of therapeutics or indicate a need for different clinical care approaches for women and men.

As a partner with NIH ICs, ORWH strategically invests in research projects by providing cofunding dollars. Sometimes the cofunding amount consists of the entire amount of an award, but more often, it is a fraction of the award. In other words, ORWH leverages its research budget by working with NIH ICs to identify topics of interest or gap areas and by negotiating cofunding amounts with IC staff to provide funding for grants that are (or applications that will be) supported by an NIH IC. For programs with a specific research area that ORWH intends to target, ORWH can issue a funding opportunity announcement (FOA) to stimulate research for a specific purpose. NIH commonly issues FOAs to target specific scientific research areas. Many of these targeted topics have been identified through a strategic plan or a report on a workshop or conference in which experts in a field convened to identify the state of the research and any existing gaps in a specific scientific area.

By interacting directly with NIH ICs, through the Coordinating Committee on Research on Women's Health, ORWH can integrate the language associated with women's health research (WHR) and SABV into a FOA before NIH releases it to the extramural community. Asking specifically for WHR and SABV research in a FOA, rather than as a post-review afterthought, greatly benefits ORWH because principal investigators (PIs) and applicants can consider



the sex and gender perspective at the beginning of the application process.

Although ORWH requests research applications in specific program areas—such as the Specialized Centers of Research (SCOR) on Sex Differences program, the Building Interdisciplinary Research Careers in Women’s Health (BIRCWH) program, and administrative supplements—through the publication of an FOA in the “NIH Guide to Grants and Contracts” (<http://grants.nih.gov/grants/guide/index.html>), ORWH also accepts requests for cofunding

research from the NIH ICs using an internal process. Program officials from the NIH ICs submit (through their own IC internal procedures), on a monthly basis, requests for cofunding to ORWH. ORWH uses a deliberate and careful internal decision process to review the requests for cofunding from the ICs to ensure that the requests advance the mission of ORWH research and address specific goals and objectives of the NIH Strategic Plan. Abstracts for each supported project are listed in Appendixes B (FY 2013) and C (FY 2014).

ORWH Programs to Advance Women's Health Research and Understanding of the Influence of Sex and Gender on Health and Disease

SCOR on Sex Differences (P50)

Established in 2002, the purpose of the SCOR program is to foster the integration of basic, clinical, and translational research on sex differences in major health areas, including musculoskeletal diseases; vascular dysfunction; health of the urinary tract; pain; depression; cognitive decline; substance use; tobacco dependence; and reproductive health, such as polycystic ovary syndrome, hormonal transitions, and the pelvic floor consequences of the reproductive process. ORWH works in partnership with NIH ICs and the U.S. Food and Drug Administration to implement and fund this program.

ORWH funding for the SCORs was \$9.14 million in FY 2013 and \$9.52 million in FY 2014. The abstracts for the SCORs are provided in Appendixes B (FY 2013) and C (FY 2014).

Research from the SCOR program has provided numerous insights into the sex differences observed in mental disorders, including depression, stress response, and the brain's response to drug cues and to treatment; pelvic floor dysfunction, fracture risk, and long-term outcomes; and understanding the mechanisms that are necessary for developing new therapeutic targets for recurring urinary tract infections (UTIs). The SCOR program has led to successful cross-center collaborations, including harmonization of measurement instruments; functional magnetic resonance imaging (fMRI) methodological approaches; publications; and a separate administrative supplement award to three SCOR sites to understand gender differences in brain function through neuroimaging markers, such as functional brain connectivity assessed with resting state fMRI, and to develop an analysis plan to be applied to the full SCOR dataset.

Selected examples of the interdisciplinary research conducted by the current SCOR grants include the following:

ORWH: SCOR on Sex and Gender Factors Affecting Women's Health (Medical University of South Carolina)

Studies using an animal model system (preclinical) and humans (clinical) demonstrate sex differences in noradrenergic sensitivity in cocaine-dependent individuals and differential brain activation of noradrenergic neurons. These findings suggest that women may be more responsive than men are to the therapeutic effects of noradrenergic agents for treatment and that these differences may be a function of anatomical differences in specific neuronal activity within men and women. This SCOR is cofunded by the National Institute on Drug Abuse (NIDA) and ORWH.

Molecular and Epidemiologic Basis of UTI in Women (Washington University in St. Louis)

Studies show that UTI is more severe in men than in women; however, women get UTI more often than men do throughout the life span. The outcome from this SCOR reveals the differences between male and female mice (preclinical) and between men and women (clinical) in the epidemiology, pathophysiology, and mechanisms involved in the stages of UTI, including initiation, progression, and outcome. SCOR investigators successfully developed a novel mini-surgical inoculation technique to study how sex differences impact disease. This SCOR is cofunded by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and ORWH.

Developing Gender-Sensitive Treatment for Tobacco Dependence (Yale University)

Many studies show that women have poorer rates of smoking cessation and exacerbated health risks from smoking than men do. However, few attempts have been made to develop sex-sensitive smoking cessation treatments. Key findings from this grant revealed that (1) sex differences exist in cholinergic tone in neurons and in subsequent responses to anti-cholinergic agents; (2) targeting stress reactivity in smoking cessation treatment benefited women more than it benefited men; and (3) the use of varenicline was more effective in initiating and maintaining smoking

abstinence in women than in men, which was related to differences in neuronal activity in different locations within men's brains versus women's brains. This SCOR is cofunded by NIDA and ORWH.

In FYs 2013 and 2014, ORWH sponsored the SCOR Director's meetings and an Interdisciplinary Scientific Symposium (see Research Meetings, Conferences, and Workshops, pp. 15–17). These events highlighted the benefits of interdisciplinary research and translational findings.

Administrative Supplements for Research on Sex/Gender Differences Program

In FYs 2013 and 2014, ORWH initiated a trans-NIH initiative designed to provide administrative supplemental funding to ongoing peer-reviewed NIH grants with the purpose of addressing the goal to include both males and females in research, including preclinical and clinical research. This effort directly addressed the policy proposal aimed at including SABV in all biomedical research. The resulting portfolio of ORWH-funded administrative supplements included multiple NIH ICs and a diverse scope of research topics.

The initiative provided 1-year supplements of approximately \$100,000 total cost to funded research; therefore, new work and approaches were required to fall within the scope of the original funded "parent" grants. For preclinical work, applicants could propose the addition of subjects (human or animal models) or tissues or cells of the sex opposite to that used in the parent grant to allow sex-based comparisons. For both preclinical and clinical work, applicants could also propose the addition of more subjects (human or animal) of one sex to a sample that already included both males and females to increase the study's ability to analyze for sex or gender differences. For clinical, methodological, computational, and modeling research, applicants could also propose new analyses of existing samples containing data from male or female subjects. In FYs 2013 and 2014, approximately equal numbers of awards were provided for preclinical and clinical research, which encompassed studies ranging from research on human tissues and biomarkers to multivariate modeling of large data from human subjects.

In FY 2013, ORWH funded 47 awards with 21 ICs for a total of \$4.6 million.

In FY 2014, ORWH funded 68 awards with 18 ICs for a total of \$6.6 million.

The abstracts for the SCORs are provided in Appendixes B (FY 2013) and C (FY 2014).

Of note, in FY 2014, the NIH Common Fund, which funds the most innovative and unique biomedical research at NIH, also adopted the administrative supplement paradigm to foster sex differences research activities within already funded Common Fund projects. This approach resulted in an additional \$3.5 million investment of supplement money to explore the biology of both sexes and to encourage the comparison of both sexes in biomedical research.

Research Enhancement Awards Program

In 1997, ORWH created the Research Enhancement Awards Program (REAP), which has developed into a larger collaborative program with the NIH OBSSR. Offered annually, REAP is a trans-NIH initiative through which ORWH partners with NIH ICs to offer funding to meritorious research on women's health that has just missed the IC pay line. ORWH pays up to \$200,000 for the first year of the project, and the IC provides the balance of the funds for the first year and all funding for additional years (called "out-year" funds). The purpose of this program is to stimulate areas of women's health research that, without ORWH funds and support, would not otherwise be funded. Some of these projects involve novel and unique approaches to understanding women's health research problems and issues that may not be fully realized by the review score. Thus, ORWH funding helps promote novel, meritorious research projects on women's health.

In FY 2013, ORWH funded 15 projects from 8 ICs for a total of \$2.7 million for this program. Examples of research topics covered under this investment include basic cell biology in females, promising treatments for urinary incontinence, controlling gestational diabetes early in gestation, combating stress, methods of stress reduction in pregnancy, and novel breast cancer imaging diagnostics.

In FY 2014, ORWH funded seven projects from four ICs for a total of \$997,000. Examples of research topics covered under this investment include lupus, obesity, vitamin D supplementation as treatment, and fetal origins of adult disease.

The abstracts for REAP projects are provided in Appendixes B (FY 2013) and C (FY 2014).

The ORWH R56 Program

R56 is a recognized activity code under which applications can be funded at NIH. The R56 program is a collaborative effort sponsored by three program offices within the Division of Program Coordination, Planning, and Strategic Initiatives, including ORWH, the Office of AIDS Research, and the Office of Behavioral and Social Sciences Research (OBSSR). This collaboration greatly enhances the breadth and depth of research topics available to NIH ICs.

The objective of the R56 program is to allow the PI to further develop the research proposal to be competitive for a new, competing renewal or resubmission application. This funding offers the investigator an opportunity to improve the research proposal significantly so that the submission or resubmission application will succeed in a highly competitive peer review and fiscal environment. In addition, the use of the R56 activity code can potentially enhance research in targeted areas, such as the influence of sex and gender on health and disease, by allowing the PI to incorporate new content into the revised application to address content relevant to the ORWH research mission. It will also improve ORWH's ability to track results of research investments.

In FY 2014, the first year of the program at ORWH, 10 projects were funded from six ICs for a total of \$2.5 million. Examples of research topics covered under this investment include the study of sex differences in (1) myocardial

ischemia and reperfusion injury, (2) toxicokinetics and metabolic disruptors of flame retardants, (3) physical activity promotion and engagement, and (4) mHealth tool development for treating depression and drug use.

The abstracts for the R56 program are provided in Appendix C (FY 2014).

Advancing Novel Science in Women's Health Research Program (R21)

In 2007, ORWH launched the Advancing Novel Science in Women's Health Research (ANSWHR) program to stimulate and support innovative research to advance new concepts in women's health research. The final receipt date for this program was October 16, 2013, and ORWH made the final payment toward this program in September 2014. This program will not be renewed in the current format.

In FY 2013, ORWH funded 10 projects from six ICs for a total of \$2.3 million under this program. Examples of research areas funded through this investment include breast cancer diagnostics, novel screening methods for bone loss, gene expression in uterine leiomyoma pathogenesis, basic research in human papillomavirus, mental health disorders, and urinary incontinence treatments.

In FY 2014, ORWH funded eight projects from six ICs for a total of \$242,000 to close out the program. Topics of these projects are the same as above, because this funding covered the second year of the 2-year award.

The abstracts for the ANSWHR projects are provided in Appendixes B (FY 2013) and C (FY 2014).

In FY 2013 and FY 2014, ORWH funded 32 projects through the REAP and R56 programs for a total of more than \$6 million to help fund meritorious research critical to women's health topics.

ORWH Cofunding with ICs in Targeted Research Areas

ORWH has provided support for a number of research efforts at NIH that permit a major focus on women's health research and research on the influence of sex and gender on health and disease. Highlights of targeted cofunding in FYs 2013 and 2014 are presented below.

Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative

The BRAIN Initiative (<http://braininitiative.nih.gov/index.htm>) catalyzes the development of tools and techniques to understand the role of the brain circuitry and connectivity in multiple neurological and psychiatric disorders. Despite the many advances in neuroscience in recent years, the underlying causes of most neurological and psychiatric conditions remain largely unknown due to the vast complexity of the human brain. To develop effective ways of helping people suffering from these devastating conditions, researchers will first need a more complete arsenal of tools and information for understanding how the brain functions both in health and disease. Until ORWH involvement, SABV had not been considered for the BRAIN Initiative. ORWH's investment will prompt current and future researchers to develop appropriate tools, techniques, and equipment to measure outcomes in both men and women.

Pain Research at NIH

The NIH Pain Consortium (<http://painconsortium.nih.gov/index.html>) was established to enhance pain research and promote collaboration among researchers across the many NIH ICs that have programs and activities addressing pain. The consortium supports initiatives, develops research resources and tools, and hosts events to promote collaboration and highlight advances in pain research. ORWH recognizes the significant difference between women and men in pain perception and reporting as well as the number and severity of pain conditions that overwhelmingly affect women more than men. In this capacity, ORWH plays a major role in integrating SABV in all pain research conducted with NIH support. ORWH supports the Centers of Excellence in Pain Education

(http://painconsortium.nih.gov/nih_pain_programs/coepes.html), research funded under the Chronic Overlapping Pain Conditions FOA (<http://grants.nih.gov/grants/guide/pa-files/pa-14-244.html>; <http://grants.nih.gov/grants/guide/pa-files/pa-14-243.html>), initiatives addressing pain management and prescription pain drug use by women (<https://prevention.nih.gov/programs-events/pathways-to-prevention/workshops/opioids-chronic-pain>), and research on the neurobiology of migraine (<http://grants.nih.gov/grants/guide/pa-files/pa-14-069.html>; <http://grants.nih.gov/grants/guide/pa-files/pa-14-068.html>). ORWH also contributed staff expertise to help develop the National Pain Strategy (http://iprcc.nih.gov/national_pain_strategy/nps_main.htm).

Bladder Health, Lower Urinary Tract Symptoms, and Chronic Pelvic Pain Disorders Research

Urologic diseases affect women and men of all ages and result in significant health impairment and quality of life issues. Programs from NIDDK support basic and clinical research on the normal and abnormal development, structure, function, and injury repair of the genitourinary tract. Areas of interest include the causes of and treatments for urological diseases and disorders, such as benign prostatic hyperplasia, urinary incontinence, and UTIs. Although both men and women have urological problems, women account for the majority of the more than 13 million Americans with urinary incontinence. ORWH cosponsors and supports a range of unique research, including research on the identification and characterization of modifiable risk factors for lower urinary tract symptoms and urinary incontinence in women through Prevention of Lower Urinary Tract Symptoms in Women: Bladder Health Scientific and Data Coordinating Centers (U01) (<http://grants.nih.gov/grants/guide/rfa-files/rfa-dk-14-018.html>) and Lower Urinary Tract Symptoms in Women: Bladder Health Clinical Centers (PLUS-CCs) (U01) (<http://grants.nih.gov/grants/guide/rfa-files/rfa-dk-14-004.html>). ORWH also supports research on the identification of biomarkers for diagnosis or treatment of multiple painful bladder conditions through the Multidisciplinary Approach to the Study of Chronic Pelvic Pain (MAPP) Research Network and the Limited Competition of the MAPP Research



Network (U01) (<http://grants.nih.gov/grants/guide/rfa-files/rfa-dk-13-507.html>). Projects for the bladder health initiative are scheduled to begin in FY 2015. For more information, please see <http://www.niddk.nih.gov/about-niddk/strategic-plans-reports/pages/niddk-recent-advances-emerging-opportunities-2015.aspx>.

Diabetes Prevention Program and Diabetes Prevention Program Outcomes Study

The Diabetes Prevention Program (DPP) was a randomized, controlled clinical trial that determined whether certain interventions could prevent or delay type 2 diabetes in adults at high risk for developing the disease. The multicenter study enrolled 3,234 overweight participants with blood glucose levels that were higher than normal but not yet in the diabetic range. Forty-five percent of participants were from minority groups that are

disproportionately affected by type 2 diabetes: African Americans, Hispanic Americans, Asian Americans and Pacific Islanders, and American Indians. The trial also recruited other groups at higher risk for type 2 diabetes, including individuals age 60 and older, women with a history of gestational diabetes, and people who have a first-degree relative with type 2 diabetes. The DPP Outcomes Study (DPPOS) was a follow-on study to follow the participants of the DPP study for the development of diabetes based on the treatment regimen in the DPP and the risk for micro-cardiovascular disease and stroke incidence and severity. ORWH provides funding to study sex and gender differences in the DPP and DPPOS datasets to understand how lifestyle intervention and drug treatment compare between men and women of various ethnic backgrounds in terms of the risk profile for cardiovascular disease and stroke. For more information, please see <http://www.niddk.nih.gov/news/for-reporters/diabetes-prevention-program-outcomes-study/pages/default.aspx>.

Osteoarthritis Initiative

Osteoarthritis (OA) affects more than 27 million individuals in the United States. Knee OA is associated with significant pain and the development of disability over time. People who are severely compromised have few effective treatment options other than joint replacement. Differences exist in the prevalence, incidence, and severity of OA between men and women and among races. Currently, no disease-modifying agents are available for treating OA. The discovery of OA biomarkers, including structural characteristics that can be observed with magnetic resonance imaging, could lead to the identification of new treatment targets and mechanisms for shorter, more efficient trials of disease-modifying agents. The Osteoarthritis Initiative (OAI) is a multicenter, longitudinal, prospective observational study of knee OA. OAI is a public-private partnership between NIH and private industry that seeks to improve the diagnosis and monitoring of OA and foster the development of new treatments. The OAI cohort of 4,796 participants is 58 percent female and, at the time of recruitment, ranged in age from 45 to 79 years old. As of FY 2014, the entire OAI cohort had completed baseline, 12-month, 24-month, 36-month, and 48-month visits in a clinic with biospecimen collection and imaging. For more information, please see http://www.niams.nih.gov/funding/funded_research/osteoarthritis_initiative.

ORWH Research Dissemination Activities

Over the past 2 years, ORWH has leveraged multiple media strategies and the latest communication technologies to reach diverse audiences. These strategies have been particularly effective in raising awareness about the need for researchers to take sex into account in preclinical studies. ORWH has linked communications, policy development, and implementation science to develop a matrixed approach to communicating with key audiences, such as the research community, clinicians, students, and women. ORWH also has developed and implemented new communication and social networking technologies to increase understanding and appreciation of women's health research as well as research on SABV's impact on health. ORWH has accomplished these goals by working closely with partners across the Federal Government and with

elected representatives, the media, health and advocacy organizations, and the public. Major FY 2013 and FY 2014 research dissemination activities are described below.

ORWH Web Site: Studying Sex to Strengthen Science

ORWH's Web site is a focal point of the Office's communication efforts with scientists, Congress, the media, the public, and other stakeholders. In 2014, ORWH launched a new area of its Web site called Studying Sex to Strengthen Science. ORWH rapidly created this site in advance of the anticipated and growing need for information about accounting for SABV. The site includes overview and background materials, research and training resources, and insights and stories from researchers across NIH ICs that are already conducting this important research. The Web site's flexible platform will continue to expand with this critical paradigm shift in science.

A to Z Guide: Sex and Gender Influences on Health

Research on the influence of sex and gender on health and disease—from basic studies on cells to large clinical trials involving thousands of patients—aims to understand the differences and similarities between males and females at all levels of biological organization. This knowledge will improve health for both women and men. In 2013, to help audiences better understand sex differences, ORWH began developing an online resource that catalogs sex and gender differences, called A to Z Guide: Sex and Gender Influences on Health. This resource summarizes published research findings and other reports on differences between men and women across a number of diseases and conditions, including cancer, depression, heart disease, influenza, and substance abuse and addiction. The guide presents scientific research in plain language, thereby enabling the public to become familiar with how sex and gender play a role in health issues.

Research Meetings, Conferences, and Workshops

Through NIH meetings, conferences, and workshops, ORWH keeps abreast of the current status of specific

scientific areas and considers where further stimulus may be needed. Ideas are generated by the scientific experts speaking at the meetings and with input from attendees. These activities usually serve as a preamble to issuing a FOA in a specific research area.

In some cases, ORWH holds meetings, conferences, and workshops to provide a forum for educating researchers on techniques or methods to enhance their understanding of the complexities associated with a particular research field.

A list of meetings, conferences, and workshops that ORWH sponsored or cosponsored, along with short descriptions of the purpose of these events, is provided below. Links to meeting reports, agendas, and other meeting materials are included when available.

Meetings, Conferences, and Workshops Held in FY 2013

2013 Women's Health Congress: Pre-Congress Workshop on the Science of Sex and Gender in Biomedical Research

SPONSORED BY ORWH, MARCH 21, 2013

This workshop was held to review aspects of sex and gender factors in health and disease—from the development of biomedical devices and therapeutics to the personalization of cardiovascular disease treatment. Discussions were held to engage and inform the health care community on the latest scientific advances in sex differences research and on study design enhancements to detect sex and gender differences.

National Women's Health Week: Scientific Symposium on Clinical Research, Inclusion, and You

SPONSORED BY ORWH, MAY 16, 2013

This scientific symposium explored the relevance, necessity, and importance of including women and minorities in clinical research, planning, and reporting on sex and gender analyses in addition to health disparities among women of color.

10th Interdisciplinary Symposium

SPONSORED BY ORWH, OCTOBER 24, 2013

ORWH sponsored the "10th Annual Interdisciplinary Women's Health Research Symposium," which brought together PIs from the SCOR and BIRCWH programs and focused on conducting interdisciplinary research and mentoring junior faculty in interdisciplinary research

methods, respectively. For more information, please see <http://orwh.od.nih.gov/news/interdisciplinariosymposium.asp>.

Intimate Partner Violence (IPV) Screening and Counseling: Research Symposium

COSPONSORED BY ORWH AND THE DEPARTMENT OF HEALTH AND HUMAN SERVICES, DECEMBER 9, 2013

This symposium identified gaps in research on IPV screening and counseling in primary health settings in order to shape new research priorities to address these gaps and produce tangible guidelines and services to protect individuals at risk.

Meetings, Conferences, and Workshops Held in FY 2014

2014 Women's Health Congress Pre-Congress Workshop: What's the Difference? Sex and Gender Influences on Women's Health

SPONSORED BY ORWH, APRIL 3, 2014

This workshop reviewed aspects of sex and gender influences on women's health. The first panel covered a range of sex and gender influences on health outcomes—from influences related to hormones on developmental trajectories and mental health to consideration of sex and gender influences on cognition and vascular function and on cardiovascular disease. The second panel focused on sex and gender influences and considerations in drugs and devices.

2014 Meeting of the Organization for the Study of Sex Differences Research

COSPONSORED BY ORWH AND THE *EUNICE KENNEDY SHRIVER* NATIONAL INSTITUTE OF CHILD HEALTH AND HUMAN DEVELOPMENT (NICHD) (R13), APRIL 24–26, 2014

The purpose of the Organization for the Study of Sex Differences is to facilitate interdisciplinary research on sex and gender differences at all levels of biological organization and to apply this knowledge for improving health care. This annual meeting brings together experts in this research area and individuals with an interest in understanding sex differences to engage, educate, and promote this field.

National Women's Health Week: Scientific Symposium on Sex Differences in Neuroscience: Past, Present, and Future Perspectives

SPONSORED BY ORWH, MAY 14, 2014

This meeting reviewed the differences and similarities between males and females in brain development and

function as well as showcased the need to study both sexes to maximize the generalizability of research findings to the entire population.

**9th Annual NIH Pain Consortium Symposium:
Biological and Psychological Factors Contributing to
Chronic Pain**

COSPONSORED BY ORWH AND THE NIH PAIN CONSORTIUM,
MAY 28–29, 2014

The Annual NIH Pain Consortium Symposium highlights pain research findings and promotes collaboration among researchers across the NIH ICs that have programs and activities addressing pain.

**Trans-NIH Sleep/Pain Workshop Summary:
Contribution of Sleep Disturbances to Chronic Pain**

COSPONSORED BY ORWH AND THE NATIONAL CENTER
FOR COMPLEMENTARY AND INTEGRATIVE HEALTH (LEAD),
MAY 29–30, 2014

The purpose of this meeting was to review evidence on the interaction between sleep and pain, with an effort to identify research gaps and understand how research in these areas can converge to capitalize on what is known about the interaction to improve patient care.

**Health and Wellness in Turner Syndrome in the
21st Century**

COSPONSORED BY ORWH AND NICHD (R13),
JULY 13–14, 2014

This meeting was held to identify and discuss the major health care problems and unmet medical needs of girls and

women with Turner syndrome and to refine major research questions about the syndrome in order to best meet patients' and health care providers' needs.

**Seventh Scientific Meeting: Genetic and Epigenetic
Basis of Temporomandibular Disorders and Related
Chronic Overlapping Conditions**

COSPONSORED BY ORWH AND THE NATIONAL INSTITUTE
OF DENTAL AND CRANIOFACIAL RESEARCH (U13),
SEPTEMBER 7–9, 2014

This scientific meeting was held to review the evidence for temporomandibular disorders (TMD) in terms of the complex family of conditions influenced by genetics, sex, and environmental and behavioral factors. These factors mediate the vulnerability of patients to TMD, many of whom will manifest other chronic pain conditions beyond their jaw and muscle problems. This meeting focused on epigenetic and genetic factors in TMD and overlapping pain conditions, including chronic headache, endometriosis, fibromyalgia, interstitial cystitis/painful bladder syndrome, irritable bowel syndrome, low back pain, myalgic encephalomyelitis/chronic fatigue syndrome, and vulvodynia.

Small Blood Vessels: Big Health Problems?

COSPONSORED BY ORWH AND THE NATIONAL HEART, LUNG,
AND BLOOD INSTITUTE, SEPTEMBER 18–19, 2014

This conference brought together scientists and clinicians from diverse areas of small blood vessel research to share their latest discoveries, identify common challenges, and foster collaborative research on the normal function and

ORWH holds meetings, conferences,
and workshops to educate researchers on
techniques to enhance understanding of
complexities associated with a
particular research field.

malfunction of small blood vessels in the brain, heart, lungs, kidneys, eyes, and other organs. Topics included the basic biology and natural history of small vessels, vascular dynamics, vessel-cellular interactions, vessels and disease, environmental effects, and research tools and innovation, with a focus on the influence of sex and gender in small vessel biology that would affect diagnosis, therapeutics, and treatment efficacy in women.

NIH Research Festival Symposium: The Health of Women of Color: A Critical Intersection at the Corner of Sex/Gender and Race/Ethnicity

COSPONSORED BY ORWH AND THE NATIONAL INSTITUTE ON AGING, SEPTEMBER 23, 2014

This meeting focused on research conducted by NIH intramural scientists on health disparities in major areas of women's health. Topics included the identification of racial and ethnic health disparities in multiple areas between populations of women across different stages of the lifespan.

The speakers discussed the importance of incorporating not only sex and gender but also race and ethnicity into all facets of biomedical research.

11th Interdisciplinary Symposium

SPONSORED BY ORWH, NOVEMBER 6, 2014

ORWH sponsored the 11th Annual ORWH Interdisciplinary Women's Health Research Symposium, bringing together PIs from the SCOR and BIRCWH programs focused on conducting interdisciplinary research and mentoring junior faculty in interdisciplinary research methods, respectively. The theme for this meeting was "Sex Differences Methodology and Reporting: Essentials for High-Impact Health Research." For more information, please see <http://orwh.od.nih.gov/news/pdf/SymposiumAgendaFINAL111214.pdf>.

References

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III. ORWH Biomedical Career Development Activities

This chapter summarizes FY 2013–FY 2014 ORWH support in two major areas: (1) interdisciplinary research and career development programs and (2) career development opportunities for women in biomedical research.

ORWH research and career development programs are based on the view that interdisciplinary approaches are essential to moving forward the science associated with women’s health and to increasing understanding of the influence of sex and gender on human health and disease. Furthermore, they are designed to advance research in women’s health and sex differences that can be translated into clinical practice. These programs use the institutional career development (K12) mechanisms.

A major component of the ORWH mandate is to develop opportunities and support for the recruitment, retention, reentry, and advancement of women in biomedical careers. Accordingly, ORWH has initiated programs to nurture the participation and advancement of women in biomedical careers and to address career issues and barriers to participation.

ORWH has made 77 awards to 39 academic institutions that have sponsored 580 scholars in more than 25 U.S. States.

Building Interdisciplinary Research Careers in Women’s Health (BIRCWH)

ORWH designed, developed, and implemented the BIRCWH K12 program in 1999 to increase the number of women’s health researchers working in a mentored interdisciplinary environment. BIRCWH supports junior faculty members who have recently completed clinical training or postdoctoral fellowships and are beginning basic, translational, clinical, or health services research related to women’s health research by pairing them with senior investigators. BIRCWH is built around three pillars: strong mentoring, interdisciplinary research, and career development. Programs accomplish these goals by ensuring that mentors represent the diverse disciplines needed to carry out interdisciplinary projects that will bridge training with research independence for BIRCWH scholars.

Since the program’s inception in FY 2000, ORWH has made 77 awards to 39 academic institutions that have sponsored 580 scholars in more than 25 U.S. States. The program continues to expand the network of scientists and clinicians who have the interdisciplinary research skills to further the study of women’s health and sex differences. As of the end of FY 2014, 27 BIRCWH programs were active across the country. Approximately 70 percent ($N = 408$) of BIRCWH scholars had submitted at least one research project grant (RPG) application after their BIRCWH scholar appointment. Among those who applied, about 49 percent ($N = 201$) ultimately received an award from NIH and other Federal funding agencies.

ORWH is responsible for the programmatic aspects of the BIRCWH program, but the grants management aspects reside within the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD). The first BIRCWH grants were awarded in FY 2000. Since then, ORWH has issued six requests for applications (RFAs). Over the past decade, ORWH has been joined in its funding support by the Agency for Healthcare Research and Quality and many NIH ICs, including the National

Cancer Institute (NCI), the National Institute on Aging (NIA), the National Institute of Allergy and Infectious Diseases (NIAID), the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), NICHD, the National Institute of Dental and Craniofacial Research (NIDCR), the National Institute on Drug Abuse (NIDA), the National Institute of Environmental Health Sciences (NIEHS), the National Institute of Mental Health, the National Institute of Neurological Disorders and Stroke (NINDS), and the NIH Office of Dietary Supplements.

ORWH has provided more than \$118 million in funding for this program, including \$11 million in FY 2013 and \$7.8 million in FY 2014.

Another round of awards is expected in fall 2015. Seven NIH Institutes—NIA, NIAID, NIAMS, NICHD, NIDCR, NIDA, and NIEHS—have joined ORWH in this reissued program announcement RFA, RFA-OD-15-001 (<http://grants.nih.gov/grants/guide/rfa-files/rfa-od-15-001.html>). For information on current BIRCWH awardees, see [Table 1](#).

Table 1. BIRCWH Awards (FY 2010–FY 2016)

Funding IC	Grant Number	Title	Principal Investigator	Institution
FY 2010				
NICHD	K12HD1438	Michigan BIRCWH Career Development Program	Timothy R.B. Johnson, M.D.	University of Michigan
NICHD	K12HD1441	UNC BIRCWH Career Development Program	Eugene P. Orringer, M.D.	University of North Carolina at Chapel Hill
NICHD	K12HD01459	Building Interdisciplinary Careers in Women’s Health	Clay F. Semenkovich, M.D.	Washington University in St. Louis
NICHD	K12HD51953	Cincinnati Interdisciplinary Women’s Health Research Career Training Grant	Joel Tsevat, M.D.	University of Cincinnati
NICHD	K12HD51958	Building Interdisciplinary Careers in Women’s Health at UC Davis	Ellen Gold, Ph.D.	University of California, Davis
NICHD	K12HD51959	Hormones & Genes in Women’s Health: Bench to Bedside	Jill Goldstein, Ph.D.	Brigham and Women’s Hospital/Harvard Medical School
NICHD	K12HD52023	UTMB Women’s Health Research Scholars Program	Abbey Berenson, M.D.	University of Texas Medical Branch
NICHD	K12HD52027	Kansas BIRCWH Career Development Program in Women’s Health	Patricia Thomas, M.D.	University of Kansas Medical Center
NICHD	K12HD52163	UCSF/Kaiser–DOR Program for Developing Independent Women’s Health Researchers	Joseph Guglielmo, Pharm.D.	University of California, San Francisco
NICHD	K12HD065879	Building Interdisciplinary Research Careers in Women’s Health at Michigan State	Claudia Holzman, Ph.D.	Michigan State University
NICHD	K12HD065987	Mayo Clinic Interdisciplinary Women’s Health Research Program	Rebecca Bahn, M.D.	Mayo Clinic
NIDA	K12DA031050	Yale BIRCWH Scholar Program on Women’s Health and Addictive Behaviors	Carolyn Mazure, Ph.D.	Yale University
NIEHS	K12ES019852	Women’s Health and the Environment Over the Entire Lifespan (WHEEL)	Deborah Cory-Slechta, Ph.D.	University of Rochester Medical Center

Table 1 (continued). BIRCWH Awards (FY 2010–FY 2016)

Funding IC	Grant Number	Title	Principal Investigator	Institution
FY 2012				
NICHD	K12HD43441	Building Interdisciplinary Research Careers in Women's Health in Pittsburgh	James Roberts, M.D., and Yoel Sadovsky, M.D.	Magee-Womens Research Institute and Foundation/ University of Pittsburgh
NICHD	K12HD43446	Building Interdisciplinary Research Careers in Women's Health	Nancy Andrews, M.D., Ph.D.	Duke University
NICHD	K12HD43451	Tulane Building Interdisciplinary Research Careers in Women's Health (BIRCWH)	Marie Krousel-Wood, M.D., M.P.H.	Tulane University
NICHD	K12HD43483	Building Interdisciplinary Research Careers in Women's Health	Nancy Brown, M.D.	Vanderbilt University
NICHD	K12HD43488	Scholars in Women's Health Research Across the Lifespan	Daniel Dorsa, Ph.D., and Jeanne-Marie Guise, M.D., M.P.H.	Oregon Health & Science University
NICHD	K12HD43489	Maryland's Organized Research Effort in Women's Health	Patricia Langenberg, Ph.D.	University of Maryland, Baltimore
NICHD	K12HD055882	Career Development Program in Women's Health Research at Penn State	Carol Weisman, Ph.D.	Pennsylvania State University
NICHD	K12HD055884	Career Development in Women's Health (CDWH)	Andrea Dunaif, M.D.	Northwestern University
NICHD	K12HD055885	Building Interdisciplinary Women's Health at MUSC	Kathleen Brady, M.D., Ph.D.	Medical University of South Carolina
NICHD	K12HD055887	University of Minnesota Building Interdisciplinary Research Careers in Women's Health	Nancy C. Raymond, M.D.	University of Minnesota
NICHD	K12HD055892	UIC Program for Interdisciplinary Careers in Women's Health Research	Stacie Geller, Ph.D.	University of Illinois at Chicago
NICHD	K12HD055894	Building Interdisciplinary Research Careers in Women's Health (BIRCWH) Scholars	Gloria Sarto, M.D., Ph.D.	University of Wisconsin–Madison
NICHD	K12HD057022	The Colorado Building Interdisciplinary Research Careers in Women's Health Program	Judith Regensteiner, Ph.D.	University of Colorado Denver
NIDA	K12DA035150	Kentucky BIRCWH Program: Training the Next Generation of Women's Health Scholars	Thomas E. Curry, Ph.D.	University of Kentucky

Program Outcomes to Date

A primary goal of the BIRCWH program is to support scholars by providing them with protected time to conduct their research and achieve research independence. Although the BIRCWH program is open to both women and men, 81 percent of the BIRCWH scholars were women between FY 2000 and October 2014. Of these, 137 (24 percent) were active BIRCWH scholars in October 2014, and 443 (76 percent) had completed their BIRCWH program.

The information that follows focuses on the BIRCWH scholars who submitted and obtained NIH research project

grants. The information is based on data maintained by ORWH and the NICHD Office of Science Policy, Analysis, and Communication.

- On average, BIRCWH scholars spend about 2.5 years in the program.
- In total, 580 scholars participated in the program between FY 2000 and FY 2014. [Figure 1](#) shows the scholars' educational backgrounds.
- In FY 2013 and FY 2014, 94 scholars joined the BIRCWH program; 80 (85 percent) were women. [Figure 2](#) shows their educational backgrounds.

Figure 1. Educational Background of BIRCWH Scholars, FY 2000–FY 2014 (*N* = 580)

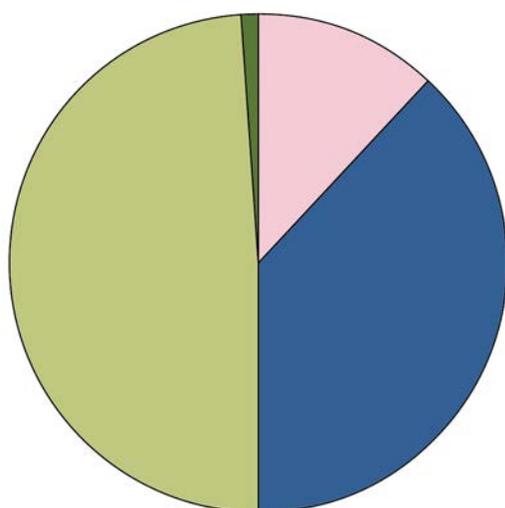
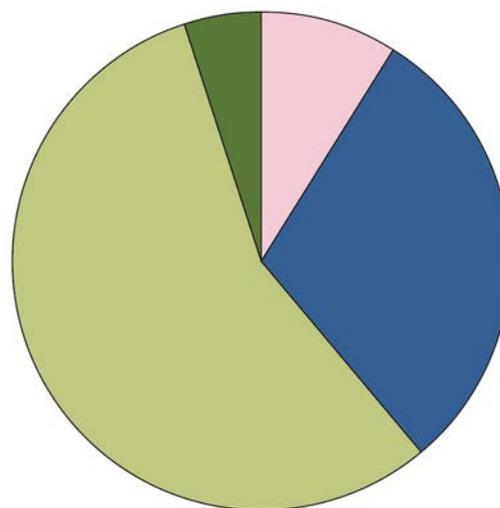


Figure 2. Educational Background of BIRCWH Scholars, FY 2000 and FY 2014 Entry Cohorts (*N* = 94)



Notes:

MD + PhD category includes scholars with dual degrees of these combinations: (M.D. + Ph.D.), (M.D. + Sc.D.), (M.D. + D.Sc.), (M.D. + D.P.H.), (M.B.B.S. + Ph.D.), (M.B. + Ph.D.), (D.D.S. + Ph.D.), and (D.V.M. + Ph.D.).

MD only category includes scholars with following equivalent degrees: M.D., M.B.B.S., M.B., D.O., D.D.S., D.M.D., and D.V.M.

PhD only category includes scholars with following equivalent degrees: Ph.D., D.Sc., Sc.D., D.P.H., and D.N.Sc.

Other category includes scholars with following degrees: D.P.T.Sc., P.H.M.D., Dr.P.H., and Psy.D.

BIRCWH Scholar Funding Success Since FY 2000

- About 40 percent ($N = 231$) of BIRCWH scholars submitted at least one NIH Career (K) grant application after their BIRCWH start date. Of those, 45 percent received an award.¹
- In total, 70 percent of scholars ($N = 408$) submitted at least one RPG² application, and 49 percent of the applicants eventually received at least one grant.
- In total, 50 percent of scholars ($N = 288$) applied for an R01 grant during the BIRCWH training or after completing the training. Approximately 42 percent of those R01 applicants (21 percent of all BIRCWH scholars) eventually received at least one R01 award.
- In addition to the R01s, substantial numbers of BIRCWH scholars applied for R03 ($N = 167$, 29 percent) and R21 ($N = 266$, 46 percent) grants. Of scholars who submitted at least one application to these mechanisms, approximately 37 percent and 30 percent, respectively, eventually received at least one award.
- Female scholars have significantly higher K grant application rates compared to their male counterparts (chi-square = 14.87, $p < 0.0001$). Nevertheless, there is no significant sex difference in terms of the award outcomes.
- Based on the RPGs included in the analysis (please refer to the footnotes for the included grant mechanisms), neither the application rate nor the award rate shows a statistical difference between male and female scholars.

Highlights of BIRCWH Research

BIRCWH research represents an extensive depth and breadth of basic, translational, and clinical science across the medical fields. In endocrinology, researchers investigate hormonal control of diet-induced type 2 diabetes and lipid and carbohydrate metabolism. Gynecology research includes studies of anti-Müllerian hormone in primate folliculogenesis and fertility preservation and of three-dimensional spatial relationships involved in pelvic organ prolapse. In neurology, investigators study clinical and biomarker characterization of inherited frontotemporal dementia and traumatic brain injury among the elderly. Researchers investigate sex and gender-based influences: sex differences in the association of blood pressure response to the cold pressor test and hypertension incidence, sex differences in vascular remodeling diseases, and sex-specific chromosomal and neural markers of aging.

The true hallmark of BIRCWH research is not only the breadth, depth, and impact on science and medicine but the multidisciplinary aspect of each research project. [Table 2](#) presents a representative listing of current BIRCWH research investigations. This listing clearly demonstrates the multiple interconnections of different medical fields within each study. This multidisciplinary approach allows BIRCWH scholars to ask questions and obtain answers at the intersections of expertise.

¹ The Career K Grants include following mechanisms: K01, K02, K07, K08, K18, K22, K23, K24, K25, and K99.

² The RPG grants examined in this report include the following mechanisms: DP1, DP2, DP3, DP5, R01, R03, R21, R29, P01, U01, and competing SBIR-STTR (R41, R42, R43, and R44) grants.

Table 2. Current BIRCIWH Research Topics

Medical Field	Research Topics
Cardiology	<ul style="list-style-type: none"> • Gender role in myocardial insulin resistance and cardiac dysfunction • Genetics and inflammation: Relevance to cardiovascular risk in women • HIV, Medicaid, and cardiovascular disease • Preeclampsia and risk of cardiovascular disease • Race (black-white) and sex divergences in the relationship between childhood risk factors and subclinical cardiovascular structural/functional changes in adults • Reducing disparities in cardiovascular health: A systematic examination of the influence of ambivalent sexism • Sex differences in the association of blood pressure response to the cold pressor test and hypertension incidence • Sex differences in the use of cardiac rehabilitation programs • Sex differences in vascular remodeling diseases
Endocrinology	<ul style="list-style-type: none"> • Diabetes and sex-based differences in islet cell transplantation • Early gender differences in the epigenetic regulation of the stress response system • Hormonal control of diet-induced type 2 diabetes in <i>Drosophila</i> • Lipid and carbohydrate metabolism • Phthalates, race/ethnicity, and gestational diabetes risk • Vitamin D and immune biomarkers of cardiovascular disease in women with type 2 diabetes
Genetics	<ul style="list-style-type: none"> • Genetic factors underlying complex traits in women's health • Genomic data integration methods and strategies toward disease etiology determination in complex women-specific disease • Sex-specific chromosomal and neural markers of aging in mid-life men and women: A lifespan perspective
Gynecology	<ul style="list-style-type: none"> • Anti-Müllerian hormone in primate folliculogenesis and fertility preservation • Behavioral approaches to contraceptive use, ambivalence, and disparities in unintended pregnancy • Epidemiology of the common and understudied condition of uterine fibroids • Modulating the host response: An opportunity for improving outcomes in prolapse repair • Pelvic floor disorders • Effects of social environments, discrimination, and gender expression on sexual minority women's health behaviors and outcomes • Three-dimensional spatial relationships involved in pelvic organ prolapse
Infectious Diseases	<ul style="list-style-type: none"> • Mucosal immunology/HIV-1 pathogenesis in women • Statins as therapeutics for human papillomavirus infections • Use of multilayer nanoparticles for combined vaginal delivery of griffithsin and dapivirine for sexually transmitted HIV prevention
Neurology	<ul style="list-style-type: none"> • Clinical and biomarker characterization of inherited frontotemporal dementia • Effects of chemotherapeutic agents on cognition • Trans-synaptic spread of tau aggregates in mouse brain networks and primary neuronal cultures • Traumatic brain injury among the elderly
Obstetrics	<ul style="list-style-type: none"> • Hypoxia-associated impairment of fetal growth: Epigenomic perspectives • Identification of biomarkers of postpartum depression • Intergenerational transmission of disparities through inappropriate weight gain in pregnancy • Maternal programming of fetal stem cells • Maternal vitamin D status, placental function, and preeclampsia: Pathways to fetal growth • Obesity in pregnancy: Improving perinatal outcomes through the study of adipokinins and an innovative prenatal care program • Oral contraceptive metabolism and effectiveness • Perineal body ripening during pregnancy • PlGF enhances viral-induced innate immune inflammatory responses in human mononuclear phagocytes; a potential mechanism for virus-related morbidity and mortality in pregnancy • Postpartum hemorrhage in district hospitals in KwaZulu-Natal, South Africa • Predictors and consequences of maternal nutrient and DNA methylation status during pregnancy in high-risk women • Preeclampsia: A stress test for cardiovascular risk • Pregnancy in patients with rheumatic diseases, preeclampsia, and cardiovascular disease • Regulation of tolerance in pregnancy and graft-versus-host disease • Role of abnormalities in pregnancy on generation of neonatal stroke • Sleep-disordered breathing, obesity, and pregnancy

Table 2 (continued). Current BIRCWH Research Topics

Medical Field	Research Topics
Oncology	<ul style="list-style-type: none"> • Breast cancer, employment, health disparities, longitudinal studies, and intervention development • Identification and provision of optimal follow-up care for breast cancer survivors • Identifying and overcoming the pathways of resistance to targeted breast cancer therapies • Imaging sites of metastasis before they happen: Targeting the premetastatic niche • Novel minimally invasive approaches to identification of epigenetic biomarkers of endometrial cancer • Tailoring radiation to the tumor: Breast cancer radioresponse
Pediatrics	<ul style="list-style-type: none"> • Association of NMDA receptor antibodies and neurocognitive dysfunction in pediatric lupus patients and in juvenile idiopathic arthritis patients • Detection of iron deficiency among adolescent females • Early intervention and prevention of non-alcoholic fatty liver disease in adolescents • Effects of obesity on metabolic changes in puberty • Investigating social and mental health for adolescent reproductive health (iSMART Health) project • Life course impacts on obesity and health disparities: Integration of perinatal health • Pediatric obesity prevention • Reproductive health disparities in adolescents in the United States
Psychology	<ul style="list-style-type: none"> • Effects of oxytocin on couples' conflict resolution behaviors • Effects of sleep disruption on pain in healthy volunteers • Implication of ovarian hormones in the neural substrates of drug craving • Influence of a weight-loss intervention on mental health in obese women with physical impairment • Influence of nutrition and weight loss on mental health in women • Neurobiological and psychological mechanisms underlying sex differences in cigarette-smoking behavior • Sex differences in impulsivity in young adults
Pulmonology	Gender differences in lung disease susceptibility in response to oxidative stress: Role of miRNAs
Rheumatology	<ul style="list-style-type: none"> • Endocrine regulation of IgG glycosylation in arthritis • Knee osteoarthritis in menopausal women • Sex-based imaging biomarkers of function in hand osteoarthritis

Additional Program Information

BIRCWH Annual Meetings

Each year, BIRCWH scholars, principal investigators (PIs), and directors gather for a programmatic meeting. In 2013, the BIRCWH meeting included a panel on “Lessons Learned from 10 Years of Fostering Interdisciplinary Careers” with several BIRCWH leaders: Dr. Ruth Greenblatt, Dr. Patricia Langenberg, Dr. Amy Major, and Dr. Yoel Sadovsky. In addition, Dr. Jeanne-Marie Guise, Dr. Judith Regensteiner, and Dr. Marie Krousel-Wood gave presentations on developing a mentor evaluation tool, promotion and tenure policies, and scholar recruitment.

In 2014, the meeting included a panel on “Supporting and Evaluating the Mentor-Mentee Relationship and Markers of Scholars’ Mentoring Team Effectiveness” with multiple BIRCWH PIs: Dr. Stacie Geller, Dr. Guise, Dr. Nancy

Raymond, and Dr. Regensteiner. Dr. Laura Lee Johnson and Dr. Virginia Miller gave presentations on how to power studies to look at sex and gender differences and on the importance of sex as a variable in women’s health research.

Both years, the meeting provided an update on BIRCWH progress and presentations on peer review, grantsmanship, and strategies for grant success.

Directory of BIRCWH Scholars

In FY 2010, ORWH developed a directory of BIRCWH scholars in response to scholars’ requests for networking opportunities. The directory includes scholars’ affiliations, professional titles, and research areas and brief statements about the BIRCWH program’s impact on their research careers. The 2013 and 2014 versions of the scholar directories are available on the ORWH BIRCWH Web site (<http://orwh.od.nih.gov/career/bircwh/index.asp>).

Women's Reproductive Health Research (WRHR) Career Development Program

Program Overview

Initiated by NICHD in 1998, the WRHR program was developed to promote the physician-scientist workforce with a focus on women's reproductive health. ORWH has provided support for this program since its inception. The primary objectives of the program are to (1) bridge clinical training with advanced research career development, (2) provide obstetrics-gynecology junior faculty with state-of-the-art training in women's reproductive health research in an academic department, (3) stimulate women's reproductive health research in a variety of disciplines, and (4) deliver a mentored research experience to help obstetrics-gynecology junior faculty attain careers as independent investigators. Program eligibility is limited to obstetrician-gynecologists (M.D. or D.O. degree) who have completed residency training in obstetrics and gynecology and are beginning basic, translational, or clinical research relevant to obstetrics and gynecology. Subspecialty training is not required of candidates practicing general obstetrics and gynecology. WRHR scholars' scientific projects focus on subspecialty areas and related fields, including maternal-fetal medicine, gynecologic oncology, reproductive endocrinology and infertility, and female pelvic medicine and reconstructive surgery.

Seventeen WRHR programs in departments of obstetrics and gynecology across the United States were competitively reviewed and selected for funding in FY 2009 and FY 2010 and remained active during FY 2013 or FY 2014 (see the list below). ORWH provided \$1,986,400 to FY 2009-awarded WRHR sites (during FY 2009-FY 2013) and \$1,320,479 to FY 2010-awarded program sites (during FY 2010-FY 2014). As of 2013, 211 WRHR scholars had been appointed to the program, of whom 64 percent were female and 21 percent held both an M.D. and a Ph.D. Evaluation of WRHR scholars' career outcomes reveals program success. As of 2013, 163 scholars (77 percent) held faculty appointments, and 59 (28 percent) were in leadership positions. Excluding scholars with less than 12 months of WRHR training, 67 percent of scholars had applied for at least one NIH competitive grant, with 54 percent of



those receiving at least one grant; 40 percent applied for R01 awards. Among those who applied, the success rate was approximately 41 percent. Male and female WRHR scholars applying for NIH funding had similar success rates.

FY 2009–FY 2013 WRHR Program Sites

A Mentoring Program in Women’s Reproductive Health Research at the University of Vermont

Institution: University of Vermont, Burlington
PI: Ira Bernstein, M.D.

Detroit Reproductive Career Development Research Center

Institution: Wayne State University, Detroit, MI
PI: Elizabeth Puscheck, M.D.

Iowa WRHR Career Development Center

Institution: University of Iowa, Iowa City
PI: Kimberly K. Leslie, M.D.

Magee-Womens Basic and Translational Reproductive Health Training Program

Institution: Magee-Womens Research Institute and Foundation, Pittsburgh, PA
PI: Robert P. Edward, M.D.

Penn Center for Career Development in Women’s Health Research

Institution: University of Pennsylvania, Philadelphia
PI: Deborah A. Driscoll, M.D.

University of Texas Medical Branch at Galveston WRHR Career Development Center of Excellence

Institution: University of Texas Medical Branch at Galveston
PI: Gary D.V. Hankins, M.D.

WRHR at the University of Washington

Institution: University of Washington, Seattle
PI: David A. Eschenbach, M.D.

WRHR Career Development Program

Institution: University of California, San Francisco
PI: Linda C. Giudice, M.D., Ph.D., M.Sc.

WRHR Career Development Program at Washington University in St. Louis

Institution: Washington University in St. Louis, MO
PI: George A. Macones, M.D., M.S.C.E.

Yale WRHR Career Development Center

Institution: Yale University, New Haven, CT
PI: Hugh Taylor, M.D.

FY 2010–FY 2014 WRHR Program Sites

Brown/Women and Infants Hospital WRHR Career Development Program

Institution: Women and Infants Hospital of Rhode Island/ Brown University, Providence
PI: Maureen G. Phipps, M.D., M.P.H.

Colorado WRHR Career Development Center

Institution: University of Colorado Denver
PI: Nanette Santoro, M.D.

Obstetrics/Gynecology Faculty Research Career Development Program

Institution: University of Alabama at Birmingham
PI: William W. Andrews, Ph.D., M.D.

Reproductive Sciences Research Career Development Center

Institution: University of California, San Diego
PI: Thomas R. Moore, M.D.

Research Career Development in Obstetrics and Gynecology

Institution: Northwestern University Feinberg School of Medicine, Chicago, IL
PI: Serdar E. Bulun, M.D.

University of Kansas Medical Center WRHR Career Development Program

Institution: University of Kansas Medical Center, Kansas City
PI: Carl P. Weiner, M.D., M.B.A.

University of Michigan WRHR Career Development Program

Institution: University of Michigan, Ann Arbor
PI: Timothy Johnson, M.D.

Research Supplements to Promote Reentry into Biomedical and Behavioral Research Careers

The ORWH/NIH Reentry into Biomedical Research Careers program provides funding for administrative supplements to existing NIH research grants. By supporting their full- or part-time research, the program assists individuals with high potential to reenter an active research career after a qualifying interruption for family or other responsibilities. It began as a pilot in 1992, expanded to a trans-NIH program in 1995, and in 2008 provided for the inclusion of scientists at the postdoctoral level. The program includes three components that help reestablish awardees as independent competitive research scientists: full participation in an ongoing NIH-funded research project, an opportunity to update and enhance research capabilities, and a carefully planned mentoring program developed by the mentor and the awardee.

As of FY 2014, more than 145 investigators had received awards under this program. In addition to support from ORWH, since its inception the program has received support from 25 NIH ICs and Offices in the NIH Office of the Director. ORWH evaluated the program in December 2006 and found that, at an average time of 5 years post-award, more than 80 percent of reentry awardees remained in academia and in scientific research. More than 80 percent remained active in publishing and grant activities and indicated that the program had helped them advance their scientific careers.

NIH Working Group on Women in Biomedical Careers

NIH established its Working Group on Women in Biomedical Careers in 2007 in response to the National Academy of Sciences report “Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.” The report suggested that increasing women’s representation would require overarching reforms, including decisive action by university administrators, professional societies, Federal funding agencies, other government agencies, foundations, and Congress. It called for broad

action to overcome institutional and environmental barriers to advancement for women in science at all career stages.

Cochaired by the NIH and ORWH Directors, the Working Group is a trans-NIH effort to consider barriers for women in science and to develop innovative strategies to promote entry, recruitment, retention, and sustained advancement of women in biomedical and research careers. The group comprises NIH Deputy Directors, Office of the Director senior staff, IC Directors, and other representatives of NIH intramural and extramural staff (members of the Working Group in FY 2013 and FY 2014 are listed in Appendix D). The Working Group hosts several committees focused on areas related to its mission, including extramural research, intramural research, women of color in biomedical careers, and communication and public outreach. Since its inception, the Working Group and its committees have sponsored national workshops, seminars, and research symposiums on career development research and interventions; issued reports on best practices; created public outreach Web sites; and developed a funding grant program to study causal factors in women’s career development. Other notable activities in FY 2013 and FY 2014 are described below.

The Working Group on Women in Biomedical Careers is a trans-NIH effort to consider barriers for women in science and to develop strategies for sustained advancement.



NIH Women in Science Web Site

With ORWH funding, the Committee on Communication and Public Outreach updated the Working Group Web site, <http://womeninscience.nih.gov>, in FY 2014. The Web site provides a compilation of resources to support women scientists and includes links to news articles, reports, and events. The Working Group also maintains an email list called NIH Updates on Women in Science; an e-newsletter containing articles and items pertaining to women in science; profiles of outstanding early-career women scientists; and examples of best practices for the recruitment, retention, and advancement of women that are being implemented in institutions and universities across the United States.

Activities of the Committee on Women of Color in Biomedical Careers

The mission of the Working Group Committee on Women of Color in Biomedical Careers (WOC) is to ensure focus on the unique career challenges facing women of color. To increase visibility and recognition of women of color, the

committee regularly identifies and nominates exceptional female researchers for society awards and lectureships, and it did so in several venues in FY 2013 and FY 2014. In addition, with funding and personnel support from ORWH and NIA, the committee developed the Women of Color Research Network (WoCRn), a social media site that provides information, mentoring, and career development opportunities for women of color in biomedical careers and for all who support diversity in the scientific workforce (<http://www.wocrn.nih.gov>). WoCRn has more than 1,400 active users. In FY 2014, the research network and Web site received the Health Improvement Institute's Aesculapius Award of Excellence. Members of the WOC committee also contribute weekly posts to the site's blog, Spectrum (<http://www.wocrn.nih.gov/spectrum/blog>), on topics such as mentoring relationships, career advice, NIH programs and initiatives, and interviews with women of color and NIH administrators.

In FY 2013, to facilitate interactions and establish local mentoring networks, the WOC committee began to support the establishment of regional networks of researchers. The first two networks, connecting the campuses of Indiana University and those of Research Triangle Park

(RTP) in North Carolina, have increased the dialogue among individuals across campuses. The committee held a conference at NIEHS in North Carolina in late 2014 to kick-start the RTP mentoring network.

The WOC committee and ORWH also hosted a symposium session at the 2014 NIH Research Festival on “The Health of Women of Color: A Critical Intersection at the Corner of Sex/Gender and Race/Ethnicity.” As data in the recently released *Women of Color Health Data Book*, 4th edition, illustrate, complex racial/ethnic health disparities exist between populations of women and across different stages of the lifespan. The symposium featured a panel of six NIH researchers—all women scientists of color—who discussed findings from health studies addressing critical race, ethnicity, sex, and gender intersections that can affect disease risk and therapeutic response.

Activities of the Committee on Research and Evidence to Promote Women in Scientific Careers

In 2008, the Working Group issued a trans-NIH funding opportunity announcement (RFA-GM-09-012), “Research on Causal Factors and Interventions that Promote and Support the Careers of Women in Biomedical and Behavioral Science and Engineering.” As a result, NIH funded 14 research grants that investigated a range of obstacles facing women at all stages of the scientific career pipeline and assessed interventions to address these obstacles. The grants totaled \$16.8 million in direct costs across 5 years with support from 11 NIH ICs and 4 Offices within the NIH Office of the Director.

Since receiving the awards, the PIs have written more than 50 articles on causal factors and interventions, given more than 120 presentations, and received 22 related follow-up grants to continue their research. The Working Group also held two workshops in FY 2013 and FY 2014 that focused on research findings. A November 2012 workshop served as a forum for data presentations from all of the grantees and as an opportunity for discussion of the results, their implications, and potential next steps for implementation. A workshop report is available at http://womeninscience.nih.gov/pdfs/causal_factor_summary.pdf.

With a growing body of evidence in hand, in June 2014, the Working Group convened a second workshop with

deans and other high-level administrators at medical and graduate schools and representatives from professional societies, government, and industry. The goal of this workshop was to develop potential institutional intervention strategies regarding leadership support, academic culture, psychological and social influences, and training and education. A summary of this workshop is available at <http://womeninscience.nih.gov/pdfs/advancingwomenscareersworkshopsummary.pdf>.

Working Group Initiatives for NIH Employees

In FY 2013 and FY 2014, the Working Group collaborated with the Office of Intramural Research (OIR) to initiate several programs aimed at improving and enhancing the NIH employee work environment. These initiatives are described below.

Back-Up Care Program. Thanks to the efforts of the NIH Child Care Board and the Working Group, the NIH Office of Research Services (ORS) launched a back-up care program in January 2012. The program began as a pilot but was formalized in 2014. Administered through a contract with the caregiver Bright Horizons, this program offers short-term child care, elder care, and self-care to NIH employees. More details about the Back-up Care Program can be found on the ORS Web site: <http://www.ors.od.nih.gov/pes/dats/childcare/pages/nihback-upcareprogram.aspx>.



Pilot “Keep the Thread” Program. The Working Group Committee on the NIH Intramural Research Program (IRP) continued support for a new pilot program aimed at increasing flexibility for NIH intramural fellows who need alternative career development schedules. This accommodation and reentry program is open to all NIH postdoctoral fellows who are supported by Intramural Research Training Awards or Cancer Research Training Awards. The program aims to recognize and proactively address common roadblocks to balancing work and personal life. Emphasizing flexibility, it provides support and information on an array of options, such as flexible work schedules and teleworking, temporary reductions of effort, fee-for-service contracting, and special volunteer status. More information about the program can be found at <https://oir.nih.gov/sourcebook/personnel/recruitment-processes-policies-checklists/keep-thread-policy>.



Northwest Child Care Center. Funds for the construction of the Northwest Child Care Center on the NIH campus were secured in the FY 2010 budget, and construction planning is ongoing. The NIH Office of Research Facilities is overseeing the project, which will add 130 child care slots on campus. NIH has awarded a contract to design and build the new center, which is projected to open in 2015. This center will come to fruition through the efforts of many individuals and groups at NIH, including the ORS, the Office of Research Facilities Development and Operations, the Child Care Board, and the Office of the

Director. Members of the Working Group in both OIR and ORWH continue to play an active role in moving these efforts forward.

NIH Intramural Program on Research on Women’s Health (IPRWH)

ORWH and the NIH OIR developed the IPRWH in 2002. It serves as the focal point within the NIH IRP for women’s health and research, and it provides a means of fostering cross-disciplinary collaborations and sharing of ideas and findings.

During FY 2013 and FY 2014, ORWH supported the IPRWH Clinical Electives Program for Medical and Dental Students in the area of interdisciplinary women’s health. The program provides short-term (4- to 12-week) clinically oriented elective rotations to senior medical or dental students in specialty fields and disciplines at the NIH Clinical Center. Elective rotations allow students to gain experience in the care of patients enrolled in investigational protocols under the mentorship of clinician-scientists. Participants also learn about the design and conduct of clinical trials and fundamental principles of translational medicine while evaluating or treating patients in clinic or in the wards.

Since 2011, ORWH has provided support to the IPRWH for an international collaborative training program with the Fonds de Recherche du Québec (FRQ). The NIH–FRQ Research Career Transition Award Program aims to foster collaborative biomedical research in mutual areas of excellence while training the next generation of research scientists. Quebec applicants are selected and funded by FRQ through a competitive process in coordination with NIH. All fellows are offered positions at NIH for 2 to 3 years and encouraged to include an element addressing sex or gender factors in their research projects. The first two fellows joined NIH in 2013 (NIAID) and 2014 (NINDS), and the program continues in 2015 with applications currently under review.

ORWH Support for Other NIH Career Development Programs and Activities

Office of Intramural Training and Education

ORWH provided financial support in both FY 2013 and FY 2014 to the Office of Intramural Training and Education (OITE) in OIR. OITE helps NIH trainees develop the scientific and professional skills they need to become leaders in the biomedical research community through programs, individual assistance, and resources regarding best practices. NIH trainees come from more than 75 countries, and more than 50 percent are women, providing NIH with a unique opportunity to promote the career development of women scientists and future leaders in women's health research across the globe. Although postdoctoral, research, and clinical fellows are the largest trainee population in the IRP (about 3,500), the program also includes approximately 400 graduate students, 650 post-baccalaureate fellows, and 1,200 summer interns.

In FY 2013 and FY 2014, ORWH supported professional skill development activities for NIH intramural trainees at all training levels through OITE. Workshops and programs that ORWH supported in whole or in part include the Scientists Teaching Science Workshop and the "Basic Science Writing" and "Writing and Publishing a Scientific Paper" courses. Each is offered multiple times per year and by videocast; select offerings are available to members of local colleges and universities. ORWH also provided financial support for courses related to leadership and management in research environments. Finally, ORWH provided financial support for OITE community college outreach.

NIH Fogarty International Center Global Health Program for Fellows and Scholars

In FY 2013 and FY 2014, ORWH supported the Fogarty International Center Global Health Program for Fellows and Scholars. This program provides supportive mentorship, research opportunities, and a collaborative research environment for early-stage investigators from the United States and low- and middle-income countries. The goal of the program is to enhance scientists' global health research

expertise and their careers. Many projects focus on women's health and maternal and child health, and the program includes a summer orientation and training initiative. In FY 2013, 47 of 80 scholars (59 percent) were female, and in FY 2014, 55 of 88 scholars (63 percent) were female.

National Institute of Diabetes and Digestive and Kidney Diseases Travel Awards

In FY 2013 and FY 2014, ORWH collaborated with the National Institute of Diabetes and Digestive and Kidney Diseases and the National Medical Association (NMA) to support a special academic skills workshop held in conjunction with the NMA Annual Convention and Scientific Assembly. Residents and fellows interested in academic medicine attend the workshop, which covers topics ranging from grantsmanship to time management skills. NIH anticipates that this opportunity will allow more physicians from medically underserved communities to receive training that they can take back to these underserved communities.

Anita B. Roberts Lecture Series: Distinguished Women Scientists at NIH

Together with the NIH Women Scientist Advisors Committee, ORWH provided funding for the Anita B. Roberts Lecture Series: Distinguished Women Scientists at NIH to highlight outstanding research achievements of women scientists in the NIH IRP. The seminar series is dedicated to the memory of Dr. Anita B. Roberts, who was chief of the NCI Laboratory of Cell Regulation and Carcinogenesis from 1995 to 2006, and honors her role as an exceptional mentor and scientist. Additional information regarding the lecture series can be found on the following Web sites:

- <http://sigs.nih.gov/wsa/Pages/Archives.aspx> (Lecture series homepage)
- <http://videocast.nih.gov/PastEvents.asp?c=151> (Videocasts for the lecture series)

Online Courses: The Science of Sex and Gender in Human Health

In FY 2014, ORWH and the Food and Drug Administration Office of Women's Health launched the third online course in a series that provides an instructional foundation for considering sex and gender in medical research and treatment. These continuing medical/nursing/professional education (CME/CNE/CPE) courses are open to the public and offered at no cost. The first two courses offer participants a basic scientific understanding of the major physiological differences between the sexes and their implications for policy, medical research, and health care. This latest installment, "The Influence of Sex and Gender on Disease Expression and Treatment," provides participants with an overall understanding of how sex and gender affect function of select organ systems as well as disease progression and treatment options. After completing the courses, researchers, clinicians, and students in the health professions are able to integrate knowledge of sex and gender differences and similarities into their research and practice. As of 2014, 4,498 people have registered for the courses and 1,179 have completed a course for credit.

Foundation for Advanced Education in the Sciences High School Summer Student Program

This program, held in summer 2013, exposed Washington, D.C., metropolitan area high school students (more than 50 percent female) to biomedical research. By reaching the students while they were still developing their career plans, it enhanced the possibility that they would choose science careers. The students learned how to design and carry out experiments and how to present their research. The program involved 18 students: 15 women and 3 men from public and private schools, including 11 minorities (2 African Americans). Students learned about the history of the program and the structure of NIH and received guidance on how to prepare and give effective research presentations. They met regularly for lunchtime sessions and gave research presentations to the group. Students also presented posters at the NIH Summer Student Poster Presentations day in August. The summer program provided an opportunity to learn not only how to carry out a research project but also how to ask important questions, how to design experiments to answer those questions, and how to communicate their results to other scientists.



Summary: Biomedical Career Development Program Activities Support the Implementation of the NIH Strategic Plan for Women's Health Research

Through its support for a wide variety of career development activities in FY 2013 and FY 2014, ORWH has made significant efforts to address the sixth goal of the NIH Strategic Plan, which is to employ innovative strategies to build a well-trained, diverse, and vigorous women's health research workforce. A range of activities provided support for the strategic plan objectives under this goal. Examples follow:

- ORWH continues efforts to support scholars working in a mentored interdisciplinary environment on women's health research through the BIRCWH program (Objective 6.2).
- The Office promotes the physician-scientist workforce with a focus on women's reproductive health through the WRHR Career Development Program (Objective 6.2).
- WoCRn mentoring and career development activities connect and empower scientists across career stages by developing a central career resource that includes contact with knowledge-rich people in the biomedical field (Objective 6.1).

- The FY 2014 NIH Working Group on Women in Biomedical Careers workshop with deans and other high-level administrators focused on organizational, institutional, and systemic factors that impede recruitment, retention, and advancement of women in science and on the essential role that mentoring serves in building scientists' career success (Objective 6.2 and 6.3).
- Intramural and extramural programmatic activities such as the NIH Keep the Thread program and the reentry research grant supplements help part-time researchers remain involved in their fields (Objective 6.4).
- The online Science of Sex and Gender in Human Health courses promote recognition and understanding of women's health among health professionals and scientists by providing up-to-date research findings for medical, dental, nursing, and other professional training (Objective 6.5).

With a focus on providing a wide variety of opportunities for professional growth, ORWH supported programs that meet the needs of a diverse group of scientists at all levels, with special emphasis on students, fellows, and early-career scientists. The activities supported in FY 2013 and FY 2014 have paved the way for future endeavors that will help expand and diversify the pipeline of future scientists and clinicians in these fields.

With a focus on providing a wide variety of opportunities for professional growth, ORWH supported programs that meet the needs of a diverse group of scientists at all levels.

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IV. Monitoring Adherence to the NIH Policy on the Inclusion of Women and Minorities as Subjects in Clinical Research

Historical Perspective

The establishment of policies for the inclusion of women and minorities in NIH-funded clinical research originates from the women's health movement. After the U.S. Public Health Service Task Force on Women's Health issued its report in 1985, NIH established a policy urging the inclusion of women in clinical research. This policy was first published in the NIH Guide for Grants and Contracts in 1987. Later that year, NIH published a policy encouraging the inclusion of minorities in clinical studies.

To ensure that NIH implements the inclusion policies, Congress made previous policy into public law through a section in the NIH Revitalization Act of 1993 (PL 103 43) titled *Women and Minorities as Subjects in Clinical Research*. In 1994, NIH revised its [inclusion policy](#) to comply with the statutory language. The Revitalization Act essentially reinforced the existing NIH policies but with four major differences:

- That NIH ensure that women and minorities and their subpopulations be included in all clinical research;
- That women and minorities and their subpopulations be included in phase III clinical trials designed such that valid analysis can be performed;
- That cost not be allowed as an acceptable reason for excluding these groups; and
- That NIH initiate programs and support for outreach efforts to recruit and retain women and minorities and their subpopulations as participants in clinical studies.

Following a Congressional request for an assessment of NIH progress in implementing the 1994 guidelines on including women in clinical research, the General Accounting Office (now the Government Accountability Office) issued another report in May 2000, titled *Women's Health: NIH Has Increased Its Efforts to Include Women in Research*. It concluded that NIH had made significant progress in implementing a strengthened policy on including women

in clinical research over the past decade and also made recommendations for how NIH could improve its processes and procedures related to monitoring inclusion. In response, NIH updated its policies and procedures.

Beginning in fiscal year (FY) 2002, NIH changed data reporting based on the 1997 Office of Management and Budget (OMB) revisions to the 1977 Directive 15, "Race and Ethnic Standards for Federal Statistics and Administrative Reporting," which provides minimum standards for maintaining, collecting, and reporting data on race and ethnicity. In October 1997, OMB published "[Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity](#)." Implementing the 1997 OMB standards involved a number of changes, including collecting and reporting information on race and ethnicity separately, whereas the 1977 OMB standards used a combined race and ethnicity format. The primary differences between the 1977 and 1997 OMB minimum standards are that (1) ethnicity is distinguished as a separate category ("Hispanic/Latino" or "Not Hispanic/Latino") and reported separately from racial data; (2) there are separate racial categories for Asian population data and Hawaiian and Pacific Islander population data; and (3) respondents may select more than one racial category, and investigators aggregate and report these selections under the "More than one race" category.

With these changes, NIH issued guidance on the updated reporting requirements and revised its reporting forms but allowed studies funded prior to 2002 to continue using the 1977 reporting standards and format. From 2002 until 2014, the number of studies reporting data using the 1997 format steadily increased, while the number of studies using the 1977 format decreased as the studies funded prior to FY 2002 were completed or converted to the 1997 OMB standard reporting format. As a result of the re-engineering efforts described below, NIH stopped accepting forms using the 1977 OMB standards in FY 2015.

Inclusion Monitoring Activities

Communication and Outreach Efforts to the Scientific Community

NIH regularly updates application, contract proposal, and intramural project instructions and guidance to ensure that investigators address inclusion as part of the proposed projects and report inclusion enrollment at least annually. Numerous policy documents, podcasts, frequently asked questions, and other resources are available for investigators and NIH staff on the [ORWH](#) and [Office of Extramural Research \(OER\)](#) Web sites. These resources discuss the elements of recruitment and retention; the NIH inclusion policy; current OMB requirements for reporting race and ethnicity data; and application submission, peer review, funding, and reporting requirements.

NIH staff members regularly provide outreach to facilitate the scientific community's understanding of NIH inclusion policy and procedures. These training and outreach efforts improve understanding of the inclusion policy and help extramural and NIH intramural investigators appropriately address these issues throughout the research funding process. Investigators are instructed to address women and minority inclusion plans in the development of their applications and proposals for clinical research.

Monitoring Compliance: Extramural and Intramural Population Data Analysis

Inclusion enrollment data from each NIH IC are presented in this report in summary figures and aggregate data tables (Appendix E), providing documentation of inclusion monitoring with some analysis. Caution should be used in interpreting these figures. Conclusions that can be reasonably drawn from the data are provided.

When assessing inclusion data, avoid directly comparing enrollment figures to the national census figures. The goal of the NIH policy is to ensure that the scientific knowledge acquired through NIH-defined clinical research will ultimately be generalizable to the appropriate population(s), not to satisfy any proportional target based upon census data. The numbers of women, men, and representatives

of racial and ethnic groups included in a particular study depend on the scientific question addressed in the study and may take into account a number of factors, such as the prevalence among women, men, or racial and ethnic groups of the disease, disorder, or condition under investigation; gaps in scientific knowledge; and disparities in health risks or outcomes. A key principle of the inclusion policy is that inclusion is integral to conducting good science. Inclusion should not be considered on the basis of absolute numbers of individuals of particular groups; rather, the focus should be on whether a given study has the right people for the scientific goals and how sex/gender, race, and ethnicity may affect outcomes in those groups.

Peer Review Expectations

Scientific Review Groups (SRGs) are instructed to focus on scientific considerations when assessing the planned enrollment for a proposed study described in a NIH grant application. The SRG evaluates the inclusion plans and finds them unacceptable if the applicant (1) fails to provide sufficient information about the planned sample, (2) does not adequately justify limited or lack of inclusion of women or minorities, or (3) does not realistically address recruitment. For NIH-defined phase III clinical trials, the SRG also evaluates the description of plans for valid analyses and whether investigators need to examine differences in the intervention effect by sex/gender, racial, and/or ethnic groups, as appropriate. For example, previous data suggesting that differences may exist could indicate a need to consider specific analyses. Applications with unacceptable inclusion plans cannot be funded until NIH staff members are assured that revised plans meet the inclusion policy requirements.

Staff Training

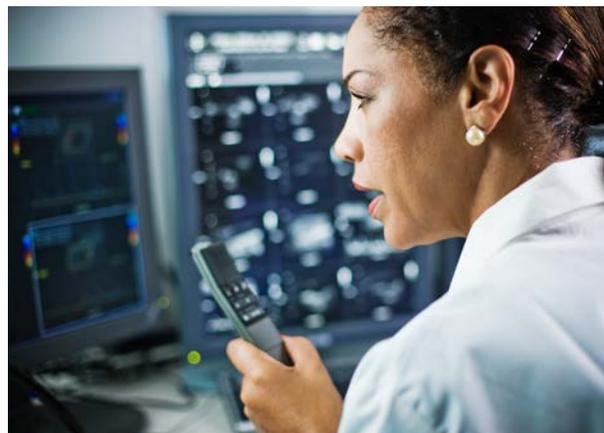
In FY 2014, NIH provided multiple training sessions for staff involved in the management or review of clinical research studies. Hundreds of NIH staff members attended the sessions either in person or via webcast. The training was also video-archived for future use. In addition, throughout FY 2014, the NIH Inclusion Policy Officer and IC inclusion policy staff conducted training at the request of NIH ICs. Inclusion policy is also incorporated into broader training efforts for both extramural and intramural staff.

NIH Efforts to Re-Engineer Inclusion Business Processes and Procedures

NIH has monitored aggregate inclusion data for study populations since FY 1994. All ICs have well-established practices for monitoring compliance with the NIH inclusion policy. In May 2002, NIH successfully deployed an electronic data system for monitoring inclusion data that was designed to allow NIH staff to more easily enter investigator-reported enrollment data and monitor projects. In the fall of 2009, the NIH Deputy Director requested that an internal task force be formed to advise the Director on the most effective ways for NIH to ensure the inclusion of women and minorities as subjects in clinical research. The Task Force on Inclusion of Women, Minorities, and Other Populations in Clinical Research considered the strengths and weaknesses of the current NIH approaches and weighed potential alternative approaches. In 2011, NIH created the Inclusion Policy Officer position in OER to oversee implementation of inclusion policies and procedures, particularly during the NIH Inclusion Re-Engineering Project, and to coordinate inclusion efforts across NIH. A specific recommendation involved restructuring the governance of inclusion to more closely align it with the overall governance structure in place at NIH. The Extramural Activities Working Group Subcommittee on Inclusion Governance was formed in November 2011. It is currently co-chaired by the Director of ORWH and the Director of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD). Members are primarily senior-level staff from the NIH Office of the Director and different ICs; other participants include individuals from both extramural and intramural divisions and from different business areas involved in implementation of inclusion policy.

In addition, NIH staff undertook a business process modeling effort to understand the strengths and weaknesses of the business processes related to monitoring inclusion. As a result of this effort, funds were dedicated to design a new inclusion data system that allows for enhanced integration with electronic systems used by applicants, grantees, and NIH staff.

NIH staff continue to monitor and document compliance with the inclusion policy and to work with grantees and



contractors to ensure compliance. Program officers and staff provide technical assistance to investigators as they develop their applications and proposals throughout the application process. Scientific review officers introduce and discuss with reviewers the guidelines and instructions for reviewing the inclusion of women and minorities in clinical research as well as the instructions and requirements for reviewing NIH-defined phase III clinical trials that take into account plans for valid analyses. When new and competing continuation applications selected for payment are deficient in meeting policy requirements, NIH staff members are required to withhold funding until the principal investigator has satisfactorily addressed the policy requirements. At the time of award and submission of progress reports, program officials monitor and verify that progress with inclusion is appropriate for the scientific goals under study.

Summary Report of NIH Inclusion Data: Comparison of FY 2013 and FY 2014 and Trend Data

Introduction

Inclusion data are tabulated from human subjects involved in NIH-defined clinical research and NIH-defined phase III clinical trials. NIH defines human clinical research as patient-oriented, epidemiologic, behavioral, outcomes, or health services research that includes human subjects. Patient-oriented research is research conducted with human subjects (or on material of human origin such as tissues, specimens, and cognitive phenomena) in which an investigator directly interacts with human subjects. Excluded from this definition are in vitro studies that use human tissues that cannot be linked to a living individual. Patient-oriented research includes (a) mechanisms of human disease, (b) therapeutic interventions, (c) clinical studies, and (d) development of new technologies. Studies falling under Exemption 4 for human subjects research are not considered clinical research by this definition. Under 45 CFR 46, Exemption 4 is defined as “research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.”

Reporting of sex/gender, racial, and ethnic categories is typically based on self-identification by the participants; participants always have the option not to identify. Although inclusion is mandated for all clinical research projects conducted or supported by NIH, for the purpose of the summary report, the primary focus of the racial and ethnic analyses is on studies involving populations in the United States. Appendix E contains numerous data tables describing data from FY 2013 and FY 2014 as well as 5- and 10-year trends.

Important Considerations When Interpreting NIH Inclusion Data

Analysis of aggregate NIH inclusion data demonstrates that substantial numbers of women and men and individuals of different races and ethnicities have been included as research subjects in NIH clinical research studies and NIH-defined phase III clinical trials. In addition, multi-year trend data are provided to show inclusion data over time. Use caution to avoid over-interpreting the figures and data tables provided in this chapter.

- **Portfolio Composition:** The NIH portfolio is broad and diverse in terms of the types of clinical research studies it supports, the size of the studies, and the expectations for inclusion within them. The size of clinical research and clinical trial portfolios and the studies within those portfolios vary substantially across the ICs, depending on such factors as IC budget, mission, and the scientific goals of any given study. Some ICs do not conduct NIH-defined phase III clinical trials or support very few of these types of studies.
- **Funding Life Cycle:** It is important to consider the nature of the funding life cycle at NIH and how that can affect inclusion enrollment information. The average length of an NIH grant award is 4 years. This means that every year, approximately 25 percent of the NIH funding portfolio turns over to newly funded awards or competing continuation awards. However, funding can be as short as 1 year and can last up to 10 years. The total amount of funding can vary from year to year, and at times, spikes or dips in appropriations may affect inclusion enrollment. Changes due to the funding life cycle may create noticeable shifts in the inclusion enrollment data, particularly for ICs with small clinical research or clinical trial portfolios. This life cycle also affects the reported enrollment numbers. In any given year, some projects have just begun, so enrollment is low. Other projects are in later years, and their enrollment numbers are higher. Still other projects have ended, so their data are no longer reported. These fluctuations across studies also can lead to notable shifts in enrollment numbers from year to year.

- **Coding Categories:** The NIH-defined clinical research category includes not only NIH-defined phase III trials but also many other types of clinical studies, such as observational and epidemiological studies, exploratory studies, and other phases of clinical trials, all of which are monitored for compliance with inclusion policy. The NIH-defined phase III clinical trial category is a subset of all NIH-defined clinical research.
- Between FY 2005 and FY 2014, percent enrollment of females in NIH-defined phase III clinical trials has ranged from a low of 53.0 percent in FY 2009 and FY 2010 to a high of 73.3 percent in FY 2013. In FY 2014, females comprised 60.0 percent of enrollment. These tables also include data on the participation of females, excluding female-only studies.²

Summary of Key Trends

Many of the figures in the body of the report demonstrate the relative distributions of participants on the basis of sex/gender, race, and/or ethnicity.

- Total enrollment over the past 10 years has ranged from approximately 14.8 million participants to more than 28 million. These are not unique individuals but the number of participants associated with the reported inclusion data records. Individuals and/or their identifiable data may be involved in more than one research study.
- Between FY 2005 and FY 2014, percent enrollment of females in NIH-defined clinical research has ranged from a low of 56.1 percent in FY 2010 to a high of 63.9 percent in FY 2006. In FY 2014, females comprised 57.2 percent of enrollment. These tables also include data on the participation of females, excluding female-only studies.¹
- Over the past 10 years, total percent enrollment of minorities in NIH-defined clinical research has ranged from 28.6 percent in FY 2008 to 43.1 percent in FY 2006. In FY 2014, 36.5 percent of participants were from minority categories.³ This includes participants from studies not based in the United States. More information on U.S.-based enrollment is provided in Appendix E.
- Total percent enrollment of minorities in NIH-defined phase III clinical trials has generally been on an increasing trend, ranging from 31.3 percent to 78.7 percent over the past 10 years.⁴ These data are significantly affected by the inclusion of participants in international studies. In U.S.-based NIH-defined phase III trials from FY 2010 to FY 2014, enrollment ranges from 23.5 percent to 37.7 percent with the same increasing trend.

Previous inclusion reports and aggregate enrollment figures for sex/gender, race, and ethnicity for FY 2006 to the present can be found on the ORWH Web site [inclusion page](#).

¹ From Table 1A: Total Enrollment for All NIH Clinical Research from FY 2005 to FY 2014 (10-Year Trend).

² From Table 1E: Total Enrollment for All NIH-Defined Phase III Clinical Trials from FY 2005 to FY 2014 (10-Year Trend).

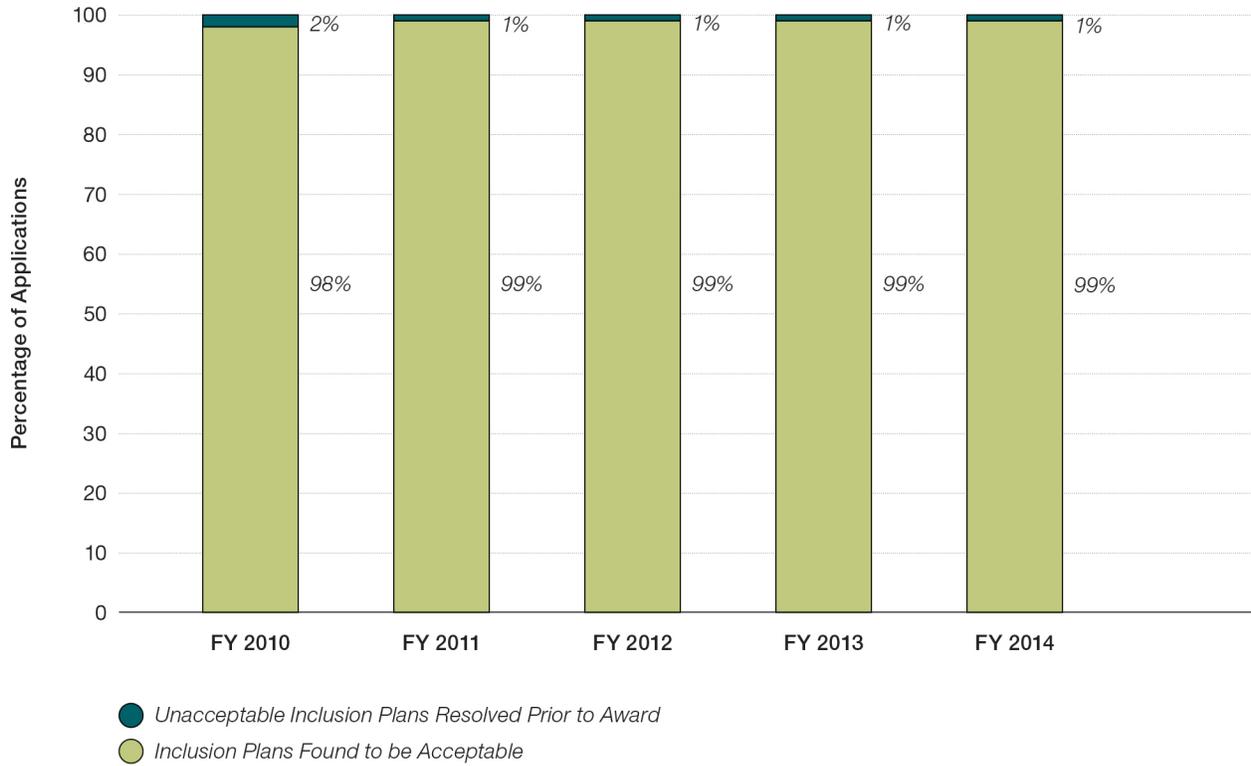
³ From Table 2A: Total Enrollment and Minority Enrollment for All NIH Clinical Research from FY 2005 to FY 2014 (10-Year Trend). Note that these data also include foreign participants. Refer to additional tables in Section 2 of Appendix E for more summary data on percent of minorities enrolled in domestic research.

⁴ From Table 3A: Total Enrollment and Minority Enrollment for All NIH-Defined Phase III Clinical Trials from FY 2005 to FY 2014 (10-Year Trend).

Acceptability of Inclusion Plans for Extramural Research Awards

Figure 1 depicts the percentage of competing clinical research awards in which the plans for the inclusion of women and minorities were found to be acceptable or unacceptable for FY 2005 through FY 2014. The data indicate that the vast majority of applications have acceptable plans for the inclusion of women and minorities during the peer review process. This trend is quite stable.

Figure 1. Review of Inclusion Plans in Competing Applications



Aggregate Enrollment: Sex/Gender

Trends in NIH-Defined Clinical Research

Figure 2 illustrates the long-term trend of recruitment by sex/gender in all NIH-defined clinical research. Over the past 5 years, the inclusion of women has ranged from 56.1 percent to 59.4 percent. This trend has remained relatively stable with enrollment generally around 60 percent for women and 40 percent for men.

Figure 3 illustrates the percent enrollment by sex/gender for FY 2013 and FY 2014 for all NIH-defined clinical research, including the percent enrollment totals for females, males, and unknowns.

Figure 4 illustrates the 5-year trend for percent enrollment of sex/gender, excluding female-only and male-only studies. For studies involving both men and women, enrollment has remained fairly stable at approximately 50 percent for women and 50 percent for men.

Figure 5 demonstrates the FY 2013 and FY 2014 percent enrollment of women and men, excluding female-only and male-only studies. Most of the change from FY 2013 to FY 2014 reflected a decrease in the proportion of men and increase in the proportion of unknowns.

Figure 2. Long-Term Trend of Enrollment of Males and Females in NIH-Defined Clinical Research

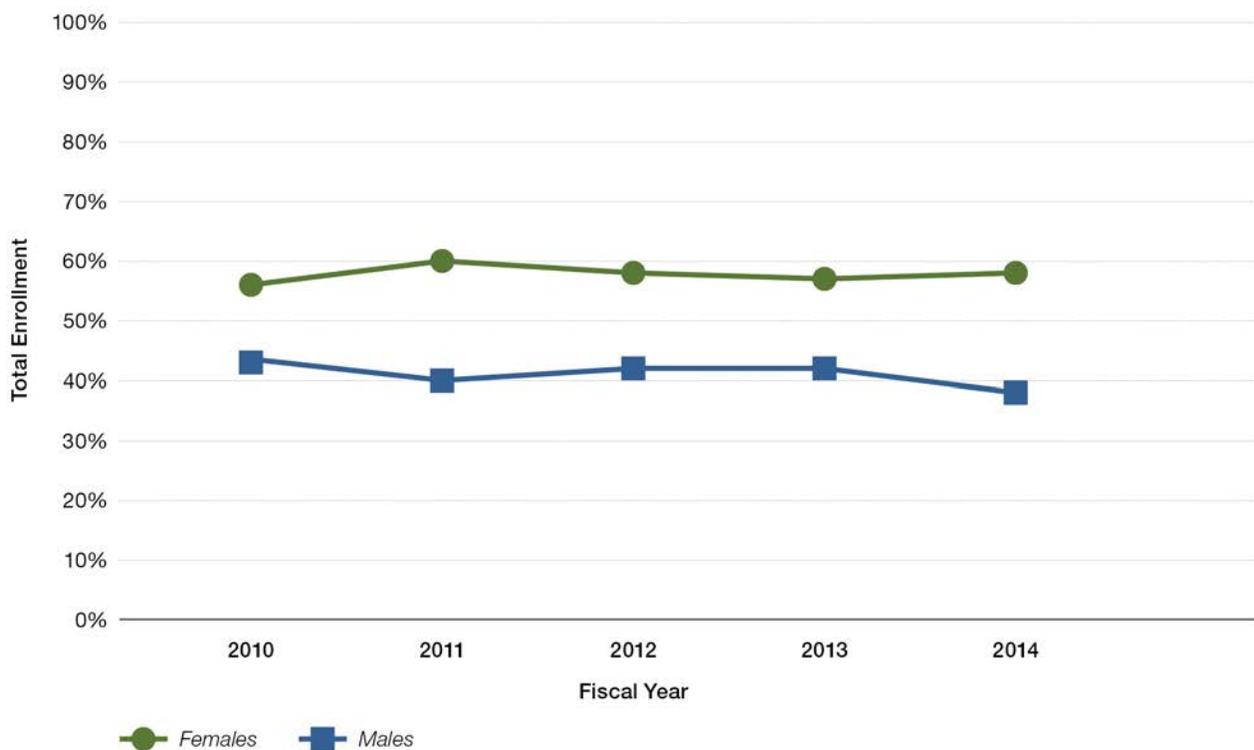


Figure 3. Percent Enrollment by Sex/Gender in All Clinical Research

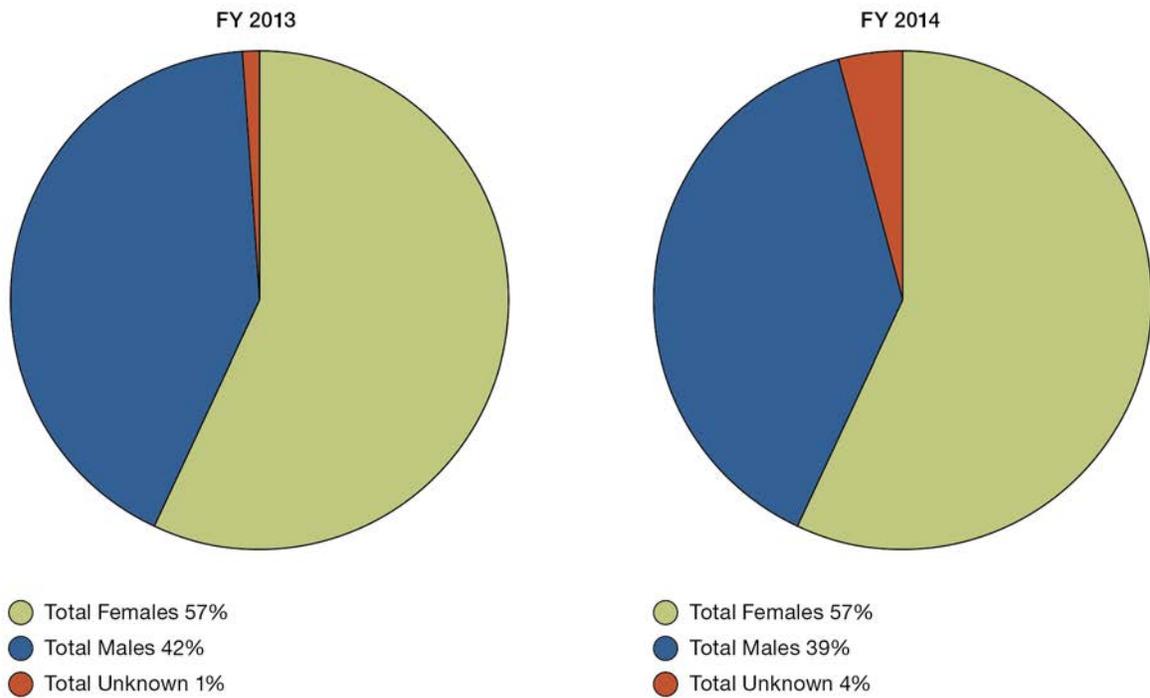


Figure 4. Long-Term Trend of Enrollment of Males and Females (Excluding Sex-Specific Studies) in NIH-Defined Clinical Research

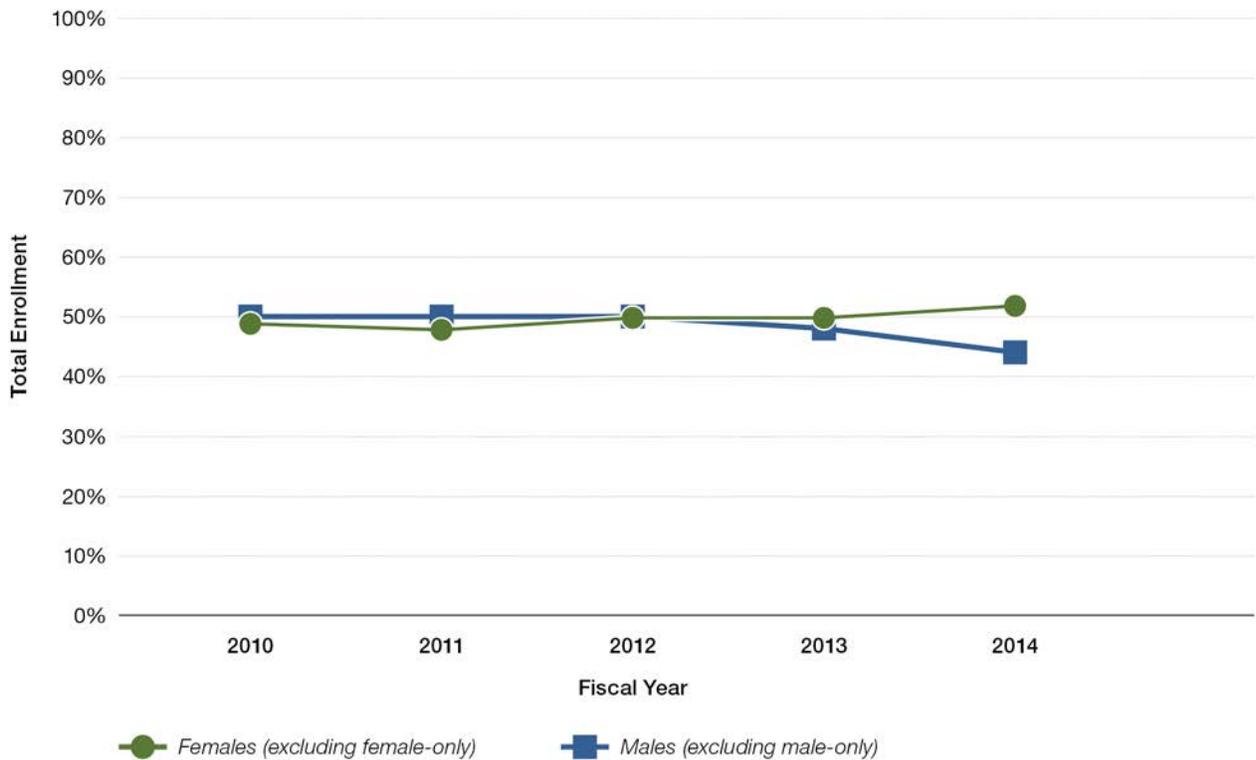
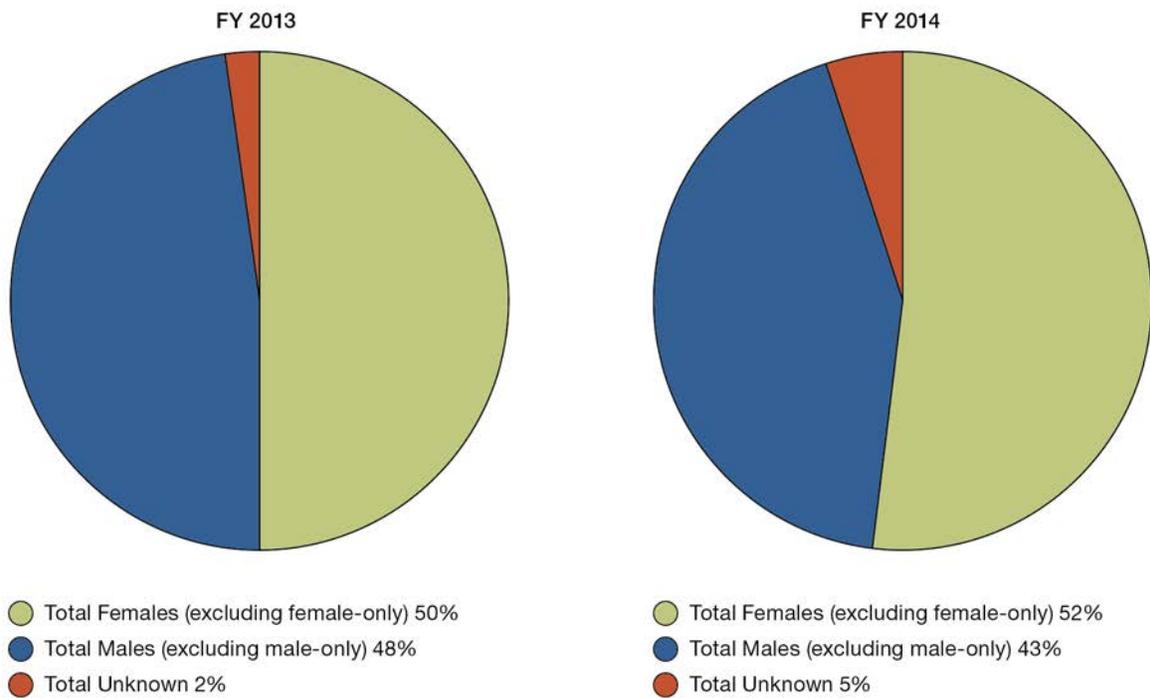


Figure 5. Percent Enrollment by Sex/Gender (Excluding Sex-Specific Studies) in All Clinical Research



Trends in NIH-Defined Phase III Clinical Trials

Figure 6 illustrates the 5-year trend of recruitment by sex/gender in all NIH-defined phase III clinical trials. Over the past 5 years, the inclusion of women has ranged from 53.0 percent to 73.3 percent.

Figure 7 demonstrates the ratio of males and females in NIH-defined phase III clinical trials for FY 2013 and FY 2014. The increase in FY 2013 is primarily the result of a large cancer trial in women. The subsequent decrease in FY 2014 likely occurred because that trial is no longer being reported.

Figures 8 and 9 compare the distribution of enrollment by sex/gender in NIH-defined phase III clinical trials (excluding sex-specific studies) for the most recent 5 years and for FY 2013 and FY 2014. The data are relatively stable, and the data in Figures 6, 7, 8, and 9 suggest changes in proportion may primarily be due to changes in enrollment of trials focused on enrolling only females or only males.

Figure 6. Long-Term Trend of Enrollment of Males and Females in NIH-Defined Phase III Clinical Trials

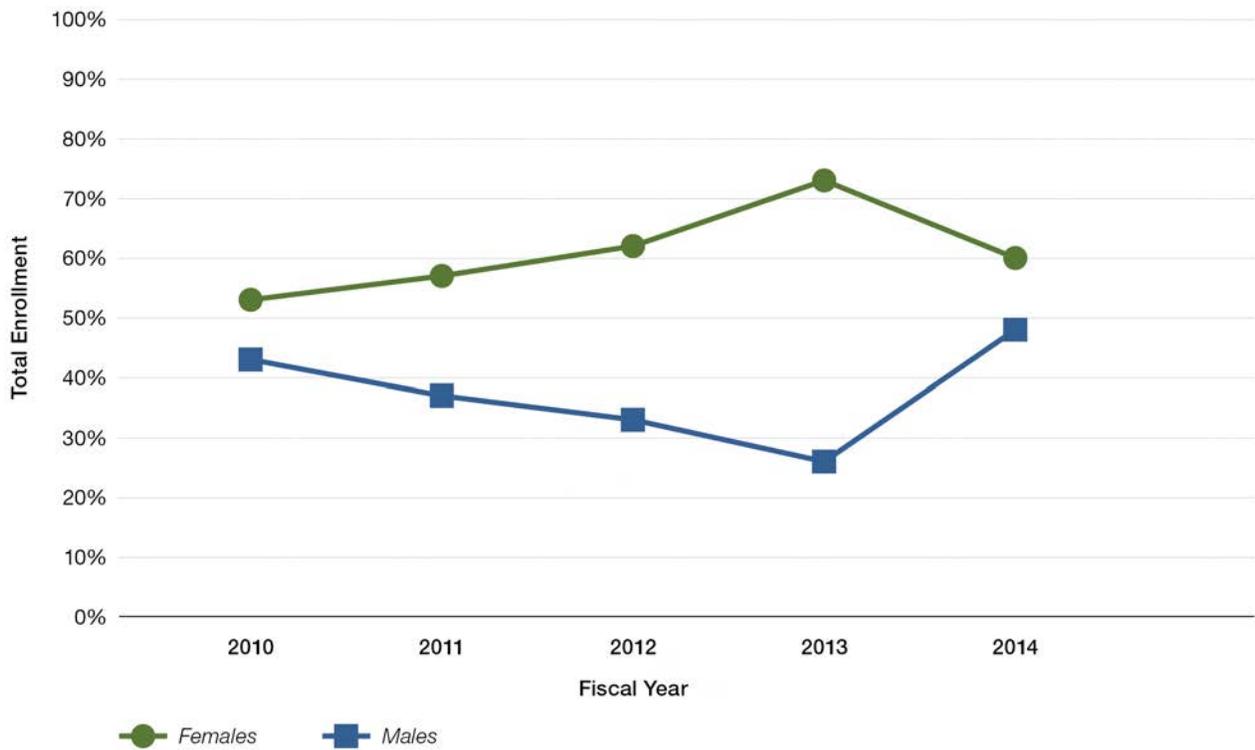


Figure 7. Percent Enrollment by Sex/Gender in NIH-Defined Phase III Clinical Trials

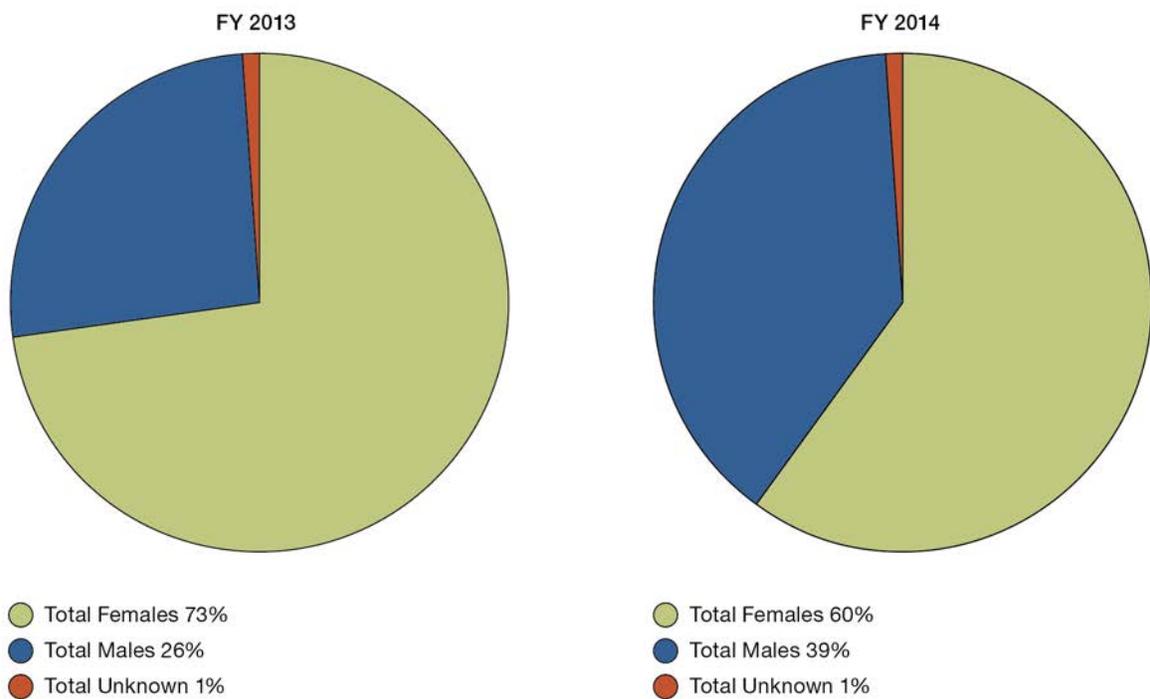


Figure 8. Long-Term Trend of Enrollment of Males and Females (Excluding Sex-Specific Studies) in NIH-Defined Phase III Clinical Trials

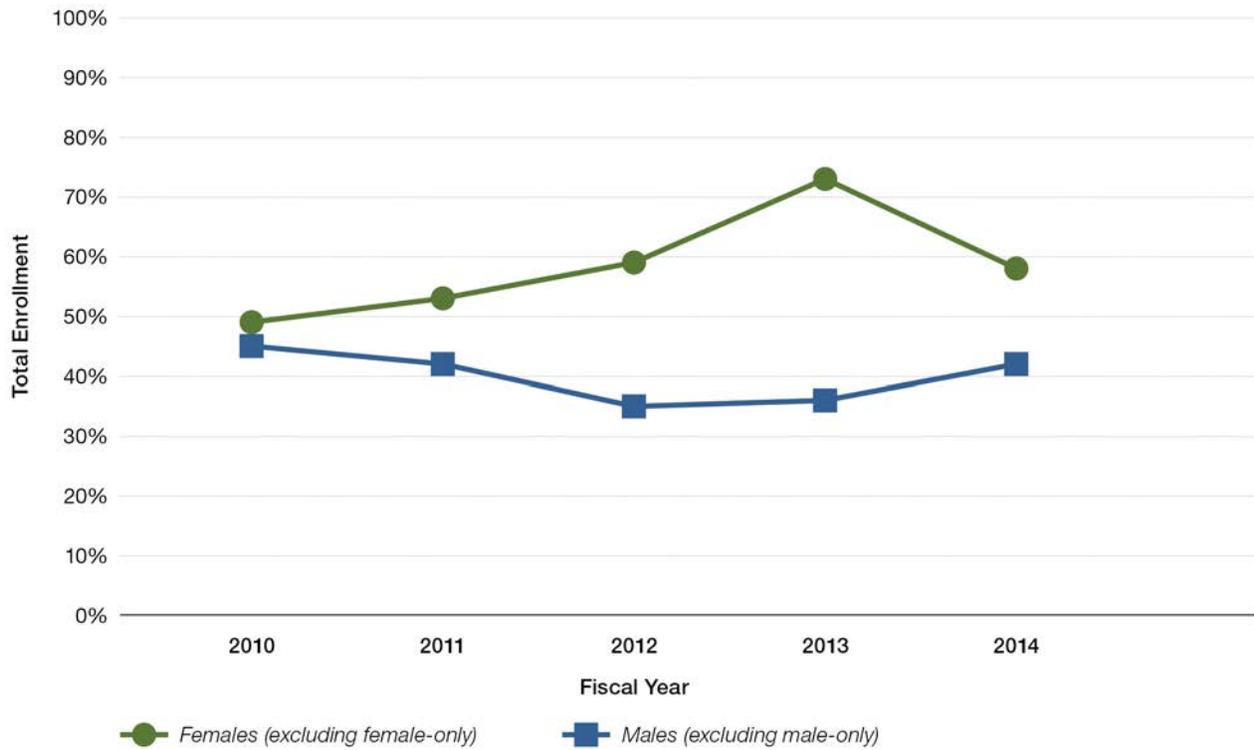
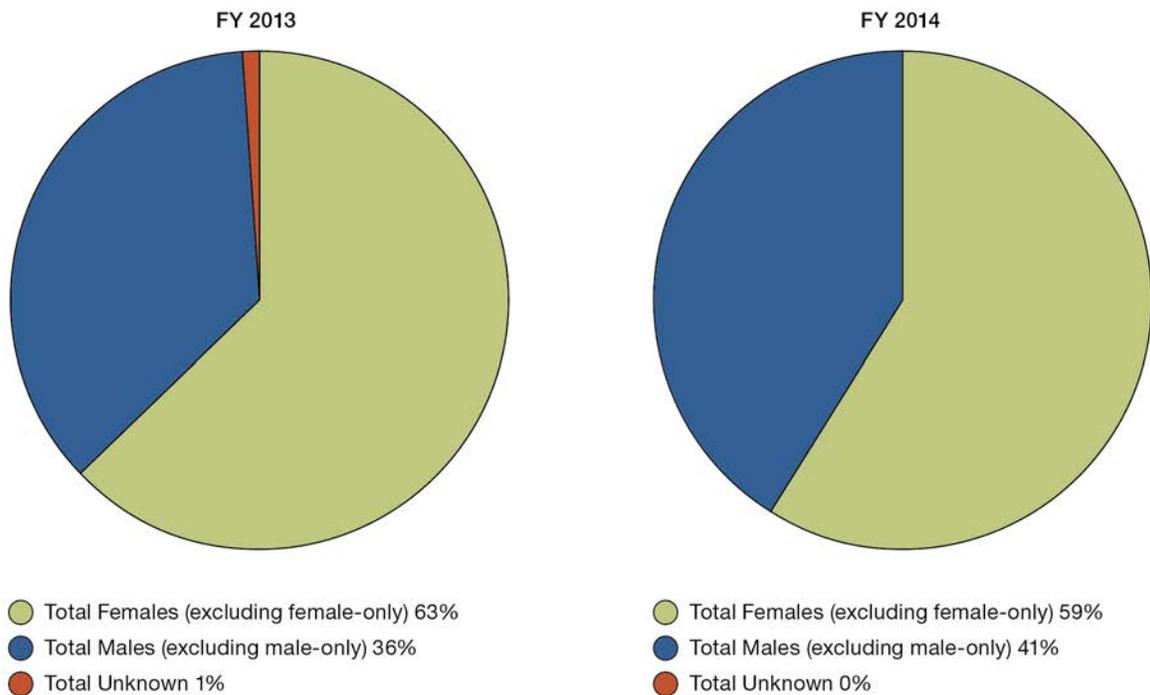


Figure 9. Percent Enrollment by Sex/Gender (Excluding Sex-Specific Studies) in NIH-Defined Phase III Clinical Trials



Aggregate Enrollment: Race and Ethnicity in Studies in the United States

Trends in NIH-Defined Clinical Research

Figure 10 illustrates the percent minority enrollment in clinical research conducted in the United States over the past 5 years. From FY 2010 to FY 2014, the percent enrollment of minorities in U.S.-based studies has remained relatively stable at around 30 percent. For information on all studies conducted in the United States and internationally, see Table 2A from Section 2 of Appendix E.

Figure 11 presents the percent total enrollment for racial categories in U.S.-based clinical research for the past 5 years (FY 2010–FY 2014). The proportions of most racial categories decreased slightly or remained stable in FY 2014, though overall the trend is fairly stable. FY 2012 saw

an increase in the proportion of unknown/not reported individuals, which was likely affected by a large study in the intramural division of the National Cancer Institute that used a health records data set in which race and ethnicity information were not available to the investigator. The proportion of participants in the unknown/not reported category has decreased during the 2-year period covered in this report.

Figure 12 illustrates the percent total enrollment for ethnic categories in U.S.-based clinical research for the past 5 years (FY 2010–FY 2014). The proportion of Hispanic or Latino participants remained relatively stable while a substantial increase in the proportion of unknown/not reported individuals was observed in FY 2012 and FY 2013. This is likely a result of the same intramural study in which participants' race and ethnicity were unknown to the investigator.

Figure 10. Long-Term Trend of Minority Enrollment in NIH-Defined Clinical Research (U.S. Studies Only)

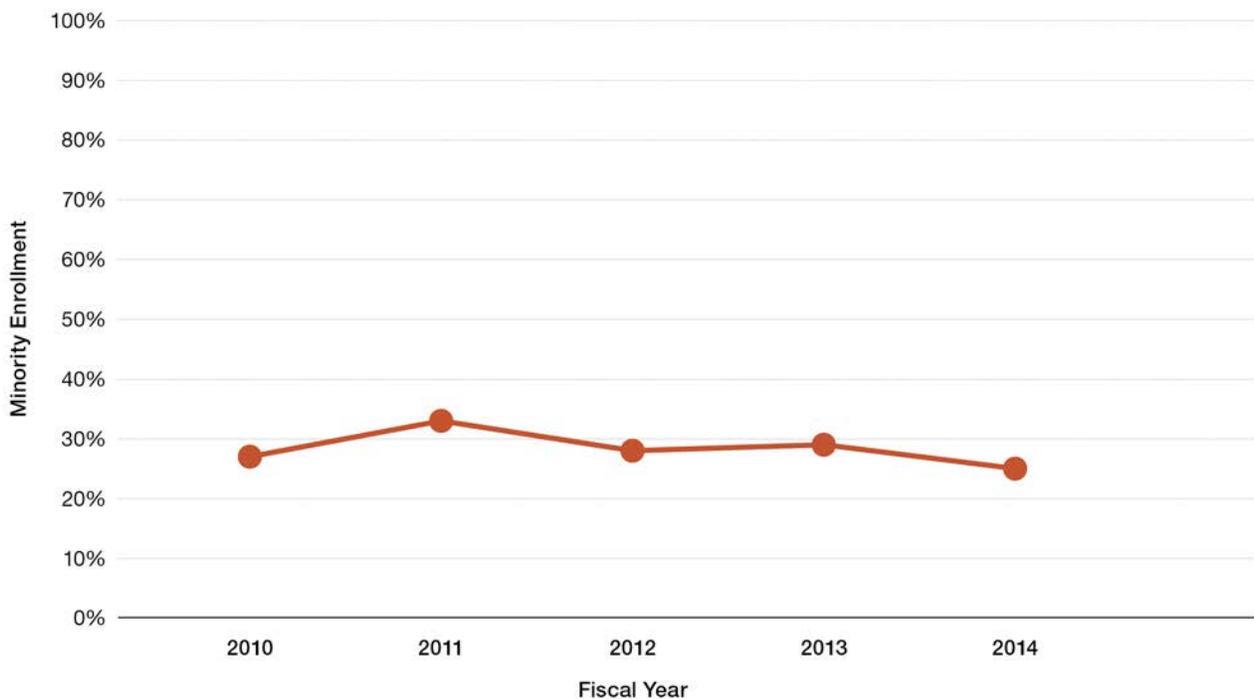
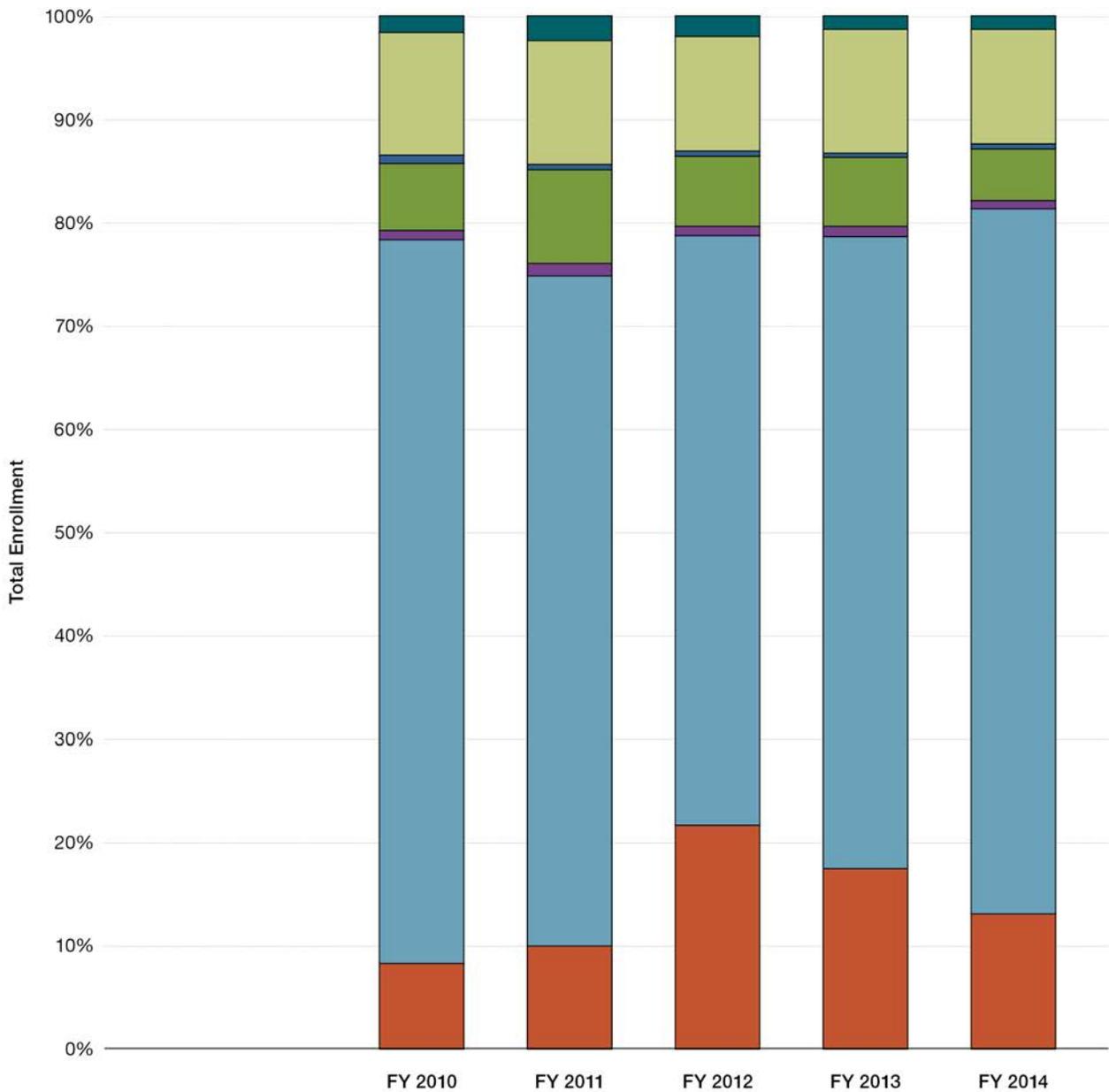


Figure 11. Long-Term Trend of Enrollment by Race in NIH-Defined Clinical Research (U.S. Studies Only)



● <i>More Than One Race</i>	1.6%	2.4%	2.2%	1.3%	1.3%
● <i>Black/African American</i>	11.9%	12.0%	11.1%	12.0%	11.1%
● <i>Native Hawaiian/Pacific Islander</i>	0.7%	0.4%	0.4%	0.3%	0.4%
● <i>Asian</i>	6.6%	9.2%	6.9%	6.8%	5.1%
● <i>American Indian/Alaska Native</i>	0.8%	1.1%	0.8%	0.9%	0.7%
● <i>White</i>	70.1%	64.9%	57.1%	61.2%	68.3%
● <i>Unknown/Not Reported</i>	8.3%	10.0%	21.7%	17.5%	13.1%

Figure 12. Long-Term Trend of Enrollment by Ethnicity in NIH-Defined Clinical Research (U.S. Studies Only)

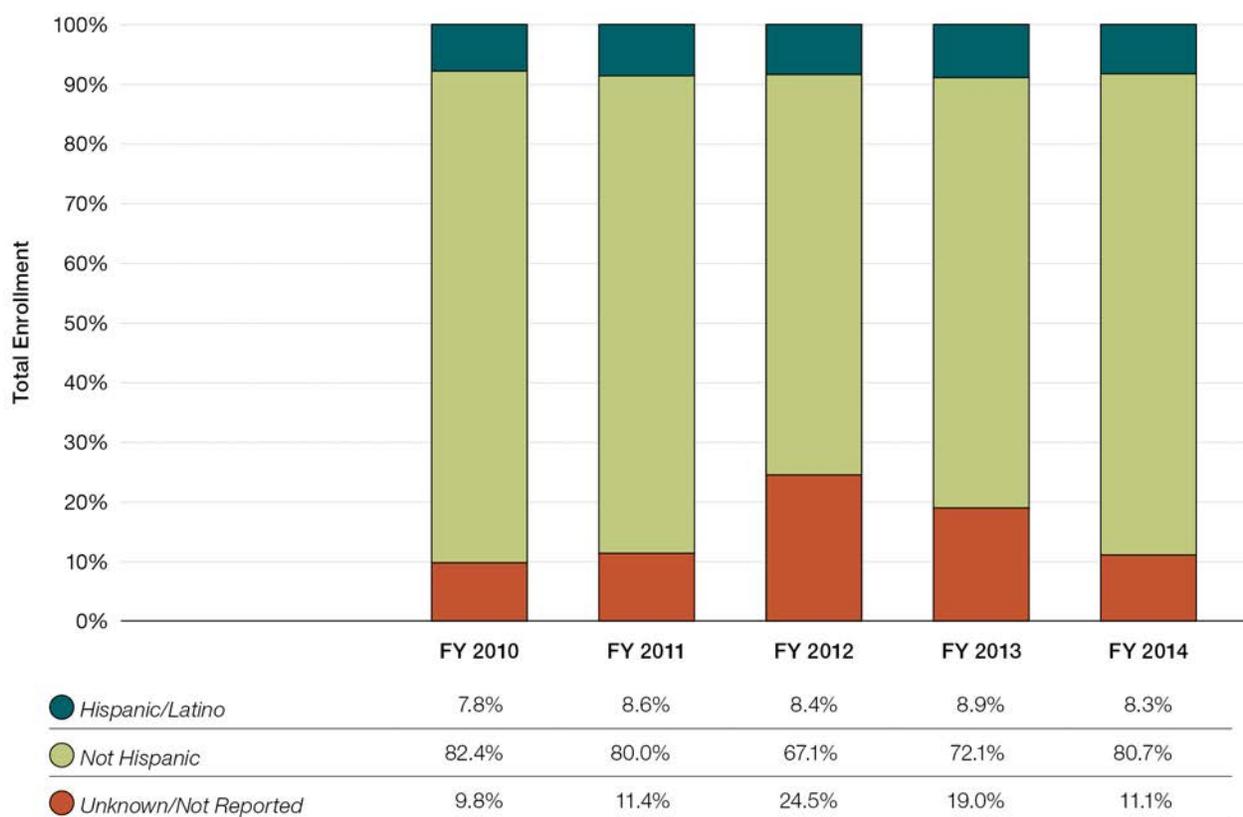


Figure 13 illustrates the percent of minority enrollment in NIH-defined phase III clinical trials conducted in the United States. The overall trend in phase III trials has been for increases in the proportion of minority populations enrolled over the past 5 years. For information on all studies conducted in the United States and internationally, see Table 3A in Section 3 of Appendix E.

Figure 14 presents the percent of total enrollment for racial categories in U.S.-based NIH-defined phase III clinical trials for the past 5 years (FY 2010–FY 2014). The proportions of most racial categories remained stable or increased in FY 2014. The racial categories comprising minority enrollment are increasing in proportion, as reflected in Figure 13. The proportion of participants in the unknown/not reported category has decreased during

the 2-year period covered in this report. An increase in the proportion of unknown/not reported individuals in FY 2012 was likely affected by the large intramural study in which race and ethnicity information were not available to the investigator.

Figure 15 illustrates the percent of total enrollment for ethnic categories in clinical research conducted in the United States for the past 5 years (FY 2010–FY 2014). The proportion of Hispanic or Latino participants remained relatively stable while a substantial increase in the proportion of unknown/not reported individuals was observed in FY 2012 and FY 2013. This is likely a result of the same intramural study in which participants’ race and ethnicity were unknown to the investigator.

Figure 13. Long-Term Trend of Minority Enrollment in NIH-Defined Phase III Clinical Trials (U.S. Studies Only)

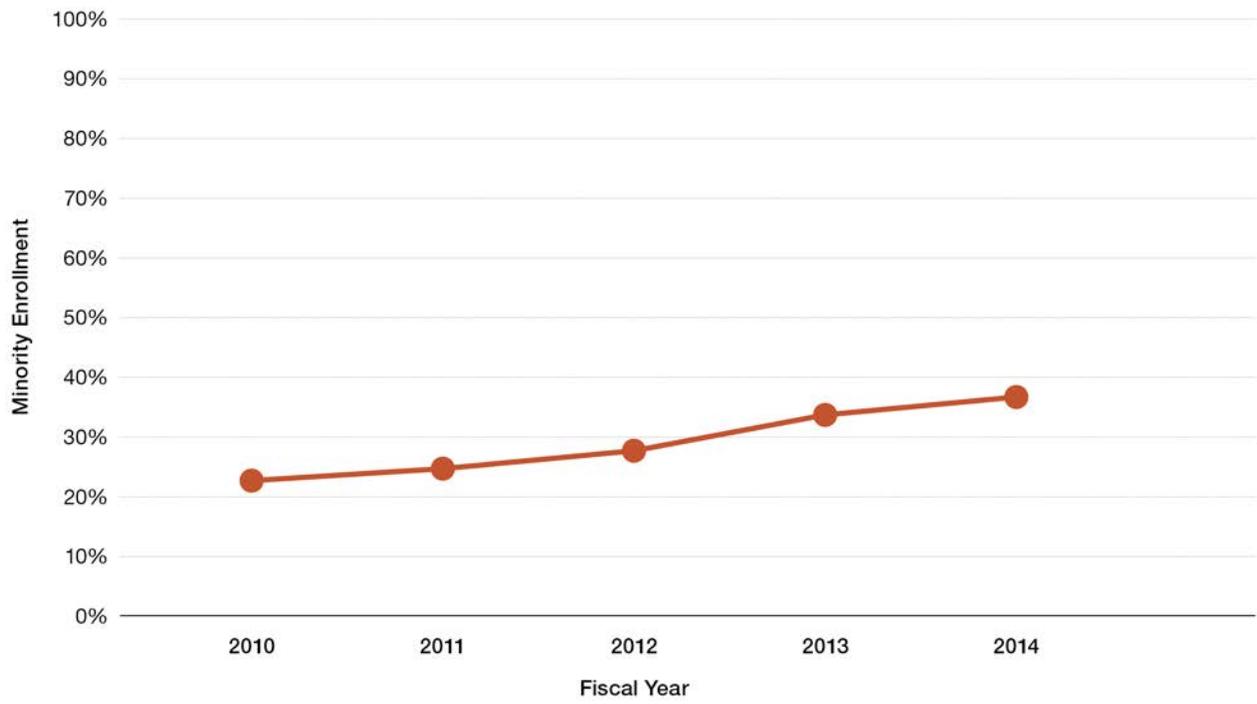
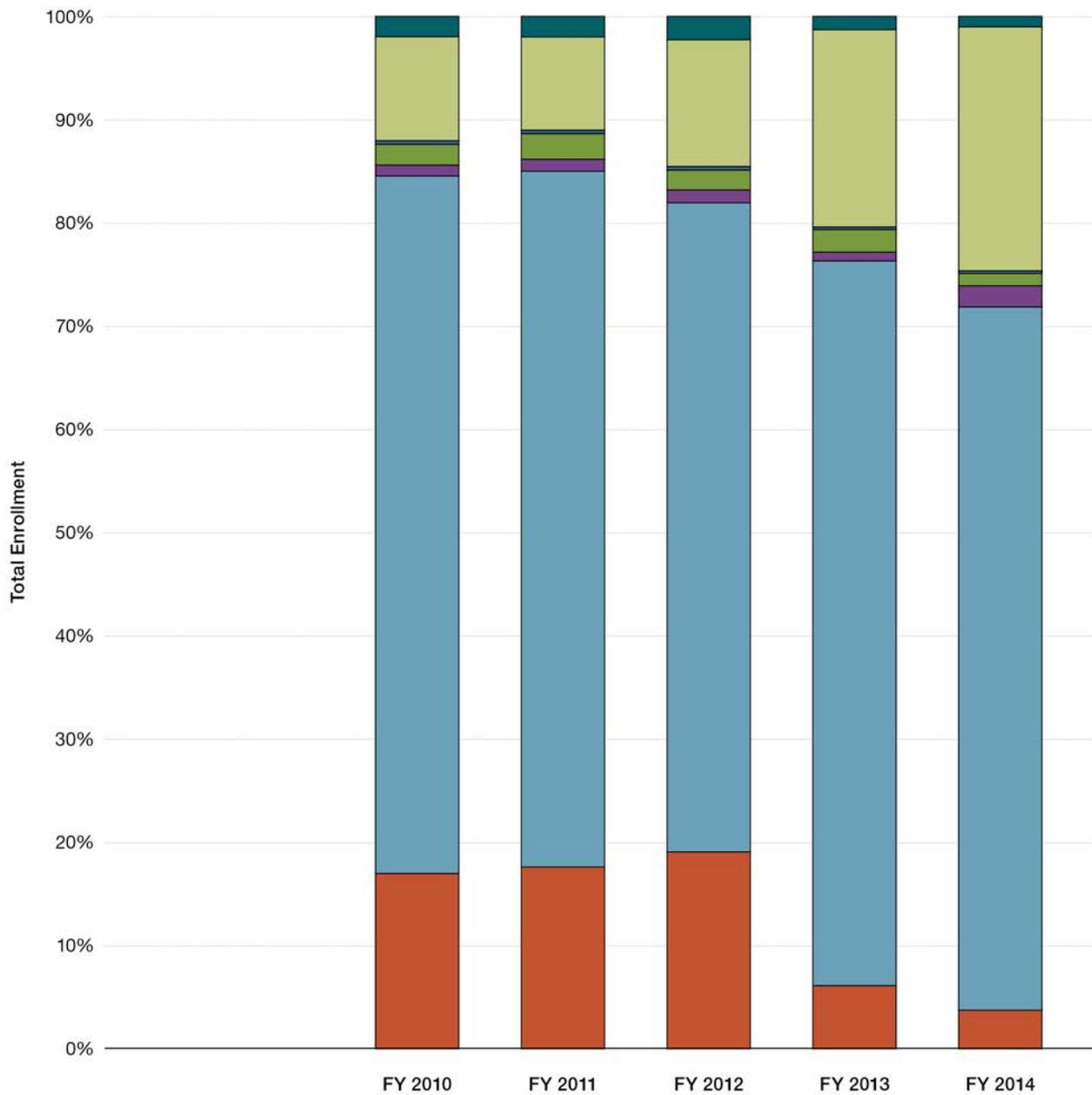
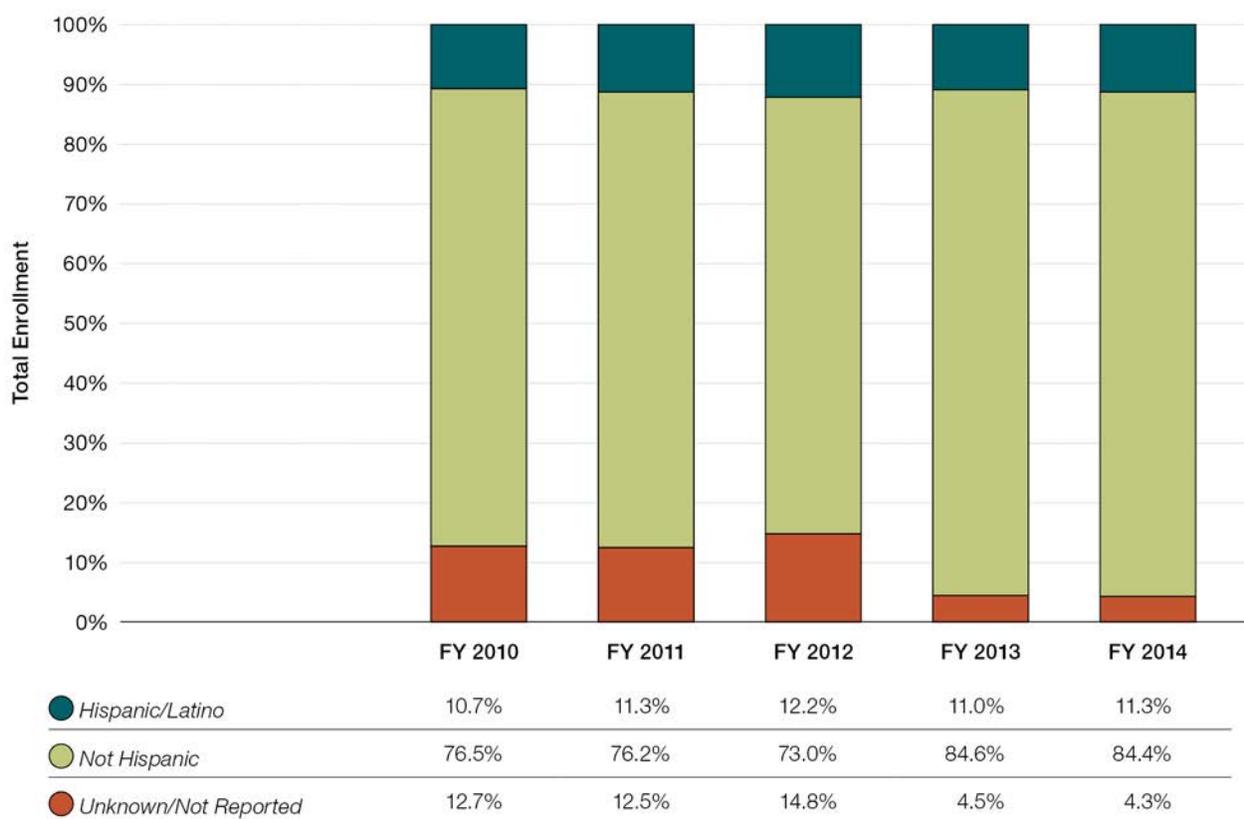


Figure 14. Long-Term Trend of Enrollment by Race in NIH-Defined Phase III Clinical Trials (U.S. Studies Only)



 <i>More Than One Race</i>	2.0%	2.0%	2.3%	1.3%	1.2%
 <i>Black/African American</i>	10.1%	9.0%	12.3%	19.1%	22.9%
 <i>Native Hawaiian/Pacific Islander</i>	0.3%	0.3%	0.3%	0.2%	0.2%
 <i>Asian</i>	2.1%	2.5%	2.0%	2.2%	1.6%
 <i>American Indian/Alaska Native</i>	1.0%	1.1%	1.2%	0.8%	2.0%
 <i>White</i>	67.6%	67.4%	62.9%	70.2%	68.3%
 <i>Unknown/Not Reported</i>	17.0%	17.6%	19.1%	6.1%	3.8%

Figure 15. Long-Term Trend of Enrollment by Ethnicity in NIH-Defined Phase III Clinical Trials (U.S. Studies Only)



Aggregate Enrollment: Race and Ethnicity by Sex/Gender in Studies in the United States

Figure 16 presents the 5-year trend for percent minority enrollment in clinical research studies conducted in the United States, broken out by sex/gender. The larger gap in distributions of male and female minority participation starting in FY 2010 and FY 2011 may have been influenced by the conclusion of a large clinical study funded by the National Institute of Mental Health on suicide prevention in military personnel; the study’s population included more men than women. What drove the proportional shift back to closer relative distributions of males and females is unclear. The overall trend suggests fairly stable distributions over the past few years. For more information on minority enrollment by sex/gender in U.S. and international studies, see Table 4A in Section 4 of Appendix E.

Figure 17 indicates the 5-year trend for percent minority enrollment broken out by sex/gender in NIH-defined phase III clinical trials conducted in the United States. The enrollment has remained relatively stable, averaging approximately 60 percent females and 40 percent males. In FY 2014, the proportion of females and males appeared to be approaching closer to 50 percent each. No specific studies are known to contribute to this trend, and it may reflect changes in enrollment that are expected due to the funding life cycle.

Figure 16. Long-Term Trend of Minority Enrollment by Sex/Gender in NIH-Defined Clinical Research (U.S. Studies Only)

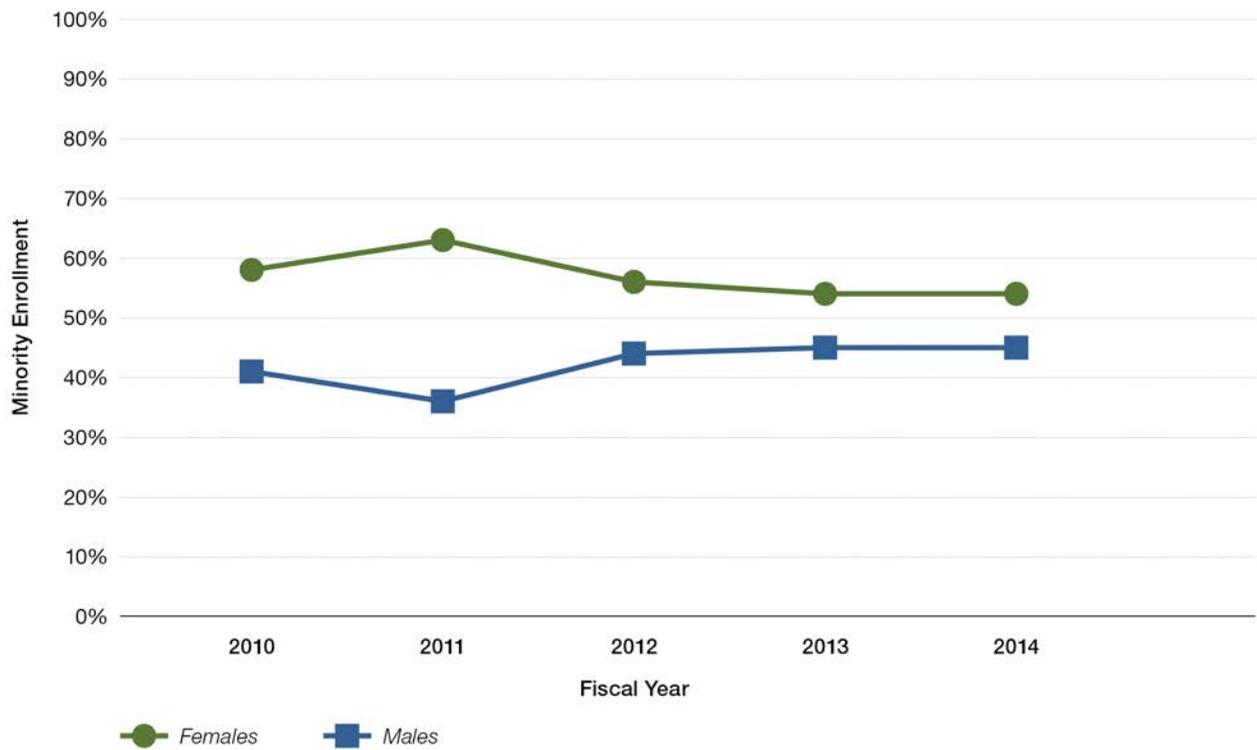
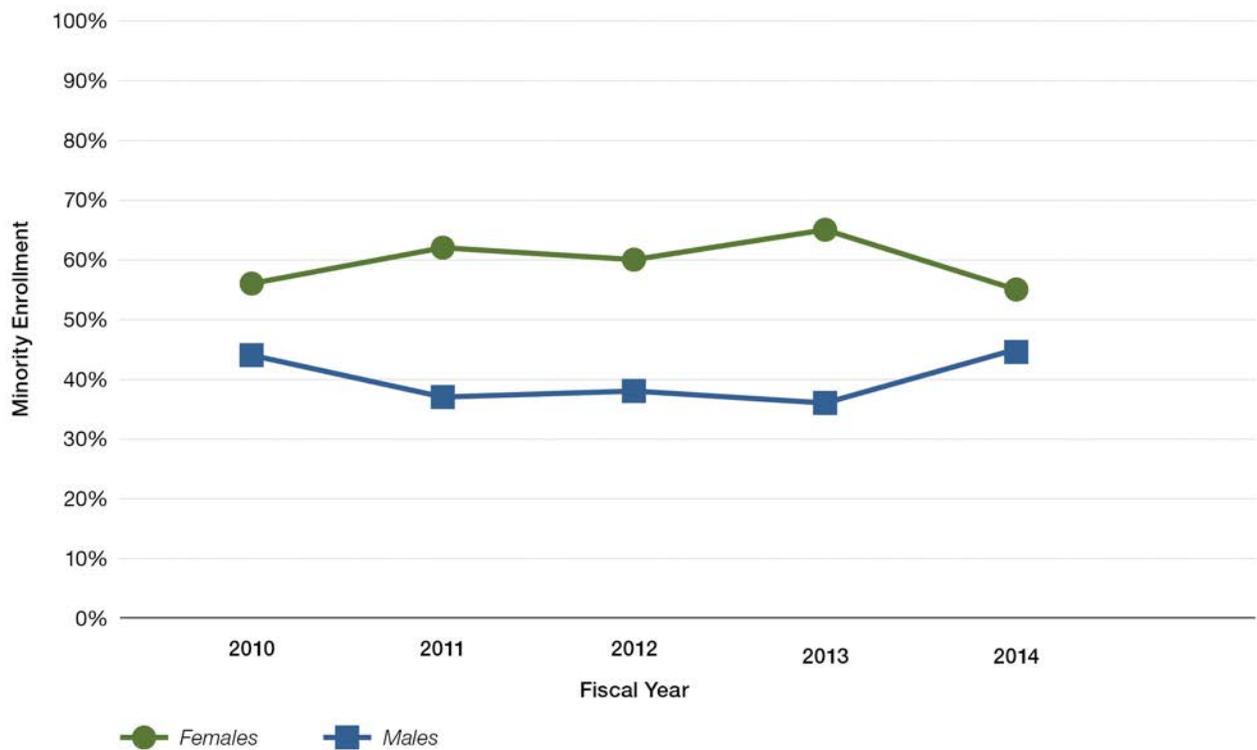


Figure 17. Long-Term Trend of Minority Enrollment by Sex/Gender in NIH-Defined Phase III Clinical Trials (U.S. Studies Only)



Summary

In summary, the overall trends demonstrate relatively stable inclusion of women and minorities in clinical research and NIH-defined phase III clinical trials over time. There does appear to be a subtle trend of increasing minority enrollment, particularly in NIH-defined phase III clinical trials. Some variability in the proportions of males and females has occurred. Trend data vary because the data for each year represent the net total of data resulting from (1) studies continuing from the prior year, (2) the addition of new studies reported, and (3) the subtraction of studies that are no longer reported. When a large-scale trial or epidemiology study starts or ends, it can affect the aggregate data and result in a shift in distributions of sex/gender and/or race and ethnicity.

ORWH Activities Related to NIH Inclusion Policies and Reporting

ORWH has undertaken a range of activities to support and promote a broad understanding of the scientific importance of inclusion in the context of the entire scientific community. Some specific examples are described below.

NIH Workshop on the Enrollment and Retention of Participants in NIH-Funded Clinical Trials

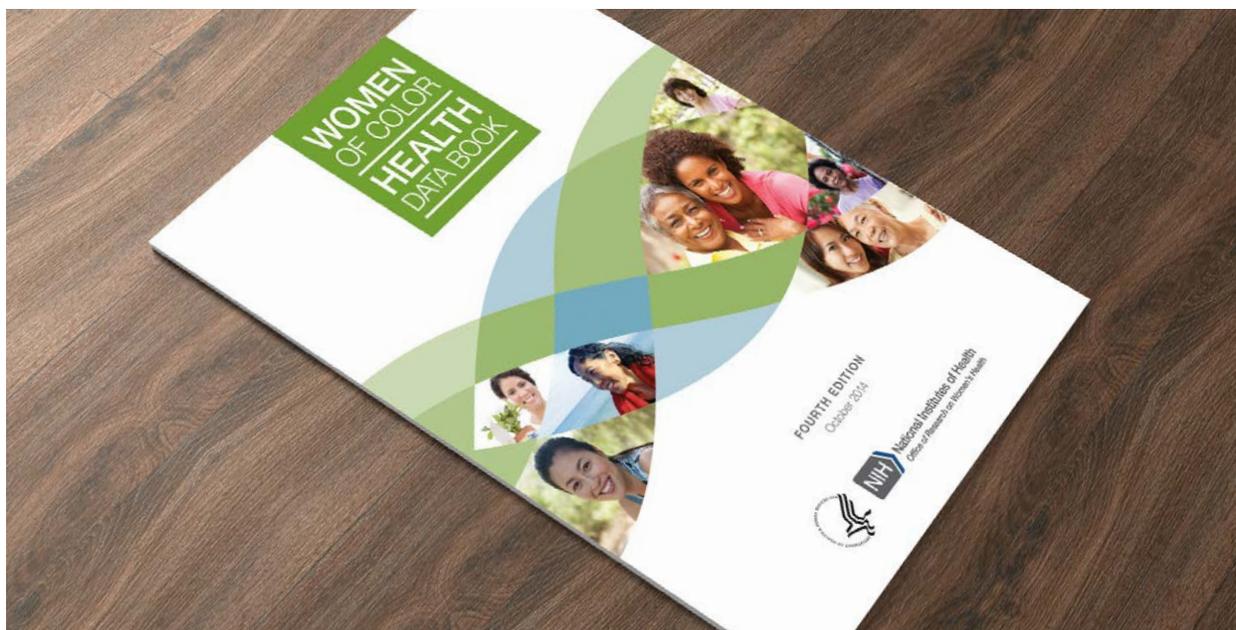
The NIH Workshop on the Enrollment and Retention of Participants in NIH-Funded Clinical Trials, held on July 25, 2014, in Bethesda, MD, provided a forum for clinical trial stakeholders to explore new strategies to address challenges to clinical enrollment and retention and to improve clinical trial participation. It involved the full range of stakeholders associated with the clinical trial enterprise, including public foundations, patients and patient advocacy groups, public and private research sponsors, researchers, and clinicians. These experts identified many strategies that are particularly relevant to women, including recognizing family and support systems and highlighting the altruistic aspects of clinical trial participation. The workshop was videocast, and a summary and other materials are available at <http://osp.od.nih.gov/office-clinical-research-and-bioethics-policy/clinical-research-policy/clinical-trials> under

“Clinical Trial Enrollment.” Key concepts and strategies emerging from the workshop included the following:

- **Challenges:** Current challenges in enrolling and retaining sufficient numbers of research participants include lack of awareness of clinical trial opportunities; inaccessibility of research sites to many communities; inclusion and exclusion criteria that exclude certain populations, such as those with multiple chronic conditions; and difficulty achieving participant diversity, which is essential to maximize the relevance and benefit of research for the public.
- **Building and Sustaining Trust:** A sustained relationship based on trust and mutual respect between research and participant communities is essential to successful enrollment and retention in clinical trials. Trust is especially important for reaching underrepresented groups, some of which may not interact with medical systems or may have limited access to them.
- **Effective Communication:** Successful clinical trial enrollment and retention requires effective communication before, during, and after trial participation. Clinical trial participants must be able to understand the protocol, and research suggests that this may require researchers to rethink standard informed consent practices.
- **Outreach and Community Involvement:** Investigators must be able to see the clinical trial experience from the participant’s perspective and use this perspective to develop innovative and customized methods to engage the specific participant community of interest.
- **Public Foundations and Stakeholder Organizations:** Public foundations and other stakeholder organizations play a significant role in improving clinical trial participation through a variety of activities.

Clinical Research, Inclusion, and You

For National Women’s Health Week in 2013, ORWH sponsored a scientific seminar on Clinical Research, Inclusion, and You, which explored the relevance and necessity of including women and minorities in clinical research planning and of reporting on sex/gender analysis



and health disparities among women of color. The patient's perspective was woven into the forum to enhance understanding of how research, policy, and inclusion play an important role in medical breakthroughs. The featured speakers were Dr. Mary Foulkes from George Washington University; Dr. Sharon Davis from the National Institute on Minority Health and Health Disparities; and Christine Eads, founder of The Duffy House, who provided the patient's perspective from her own experience as a clinical trial participant. The seminar was videocast, and a summary is provided on the ORWH Web site.

Women of Color Health Data Book

In 2014, ORWH published the *Women of Color Health Data Book*, Fourth Edition, the most up-to-date resource informing health care providers and researchers in biomedicine and health policy about the unique health issues of women of color. This publication presents data on race/ethnicity and disease with relevant discussions of historical, cultural, and socio-/geo-demographic factors that affect the health status of women of color.

With this resource, ORWH can reach clinicians who deliver care, researchers who are designing studies and recognize the need to take sex and race into account, and public health workers who want to better understand the health needs of women across the country and abroad.



Enrolling Pregnant Women in Clinical Research Forum

The inclusion of pregnant women in clinical research has garnered renewed interest in the scientific community. Pregnant women are often excluded from clinical studies, and few studies are designed to address health concerns and questions relevant to them. This is unacceptable for two reasons, as summarized by Baylis (2010): "Pregnant women get sick and sick women get pregnant." The exclusion of pregnant women from most clinical research has resulted in a lack of evidence to inform health care and treatment decisions.

On September 29–30, 2014, the National Institute of Allergy and Infectious Diseases, in partnership with



ORWH, the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, and the Bill & Melinda Gates Foundation, hosted a workshop on including pregnant women in clinical trials of antimicrobials and vaccines. The workshop included approximately 40 participants representing Federal Government agencies, academia, and pharmaceutical development. Its objectives included identifying key knowledge gaps, opportunities, and barriers to research during pregnancy in the context of global health, vaccines, and antimicrobials and developing research tools to assist with the design and implementation of clinical trials of antimicrobials. As an output of the

meeting, working groups formed on three topic areas: (1) reporting birth defects, (2) developing electronic case report forms in the Clinical Data Interchange Standards Consortium for studies during pregnancy, and (3) developing Web-based resources for investigators implementing clinical research on antimicrobials and vaccines during pregnancy. These groups will continue working together to advance efforts in their various technical areas. The organizers are currently working to identify possible avenues for publication of information shared at the meeting.

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V. NIH Budget for Women's Health Research

NIH Budgetary Expenditures for Research on Women's Health, FY 2013 and FY 2014

The amount of funding that NIH invested in research during FY 2013 and FY 2014 is presented in this budget summary, which focuses on diseases or conditions of relevance to women. The data in the tables in this chapter were obtained from budget officials at the individual NIH ICs, compiled by the NIH Office of Budget, and submitted to ORWH for inclusion in this report.

“Women's health conditions,” as defined in section 141 of the NIH Revitalization Act of 1993 (42 U.S.C. § 287d), include all diseases, disorders, and conditions—

1. That are unique to, more serious, or more prevalent in women;
2. For which the factors of medical risk or types of medical intervention are different for women, or for which it is unknown whether such factors or types are different for women; or
3. With respect to which there has been insufficient clinical research involving women as subjects or insufficient clinical data on women.

Research on women's health conditions includes research on preventing such conditions and applies to women of all ages and racial and ethnic groups.

ORWH has collaborated with the HHS Coordinating Committee on Women's Health (CCWH) to report budgetary expenditures on women's health throughout HHS. Multiple groups are involved in this effort, which is coordinated by the Office on Women's Health in the Office of the Assistant Secretary for Health; they include the HHS Office of the Assistant Secretary for Financial Resources and other women's health offices and programs across HHS agencies.

Data collection for budgetary reporting on women's health research relies on the use of spending categories for diseases or disorders relevant to women. Over the years, however, changes have been made to the data collection process to include (1) new disease categories; (2) new methods to

standardize the proportion of the budget accounted for by women's health research when enrollment data are not available; and (3) the inclusion of men as a comparison for those women's health categories in which both men and women may be affected. For this latter point, the data collection process has evolved to account for studies in which men and women are both included and reported. For example, in some of the reports prior to FY 2003 and FY 2004, the budgetary reporting on women's health expenditures focused on single-gender studies; studies to evaluate sex/gender differences; and studies of diseases, disorders, and conditions that are unique to women. Previous reporting also used prevalence data as part of the reporting criteria and included research on diseases, disorders, and conditions that are not unique to one sex but for which there is documented evidence of greater prevalence in one sex by a ratio of at least two to one, or for which a specific gender-related consideration exists.

For the purpose of this report, budgetary expenditures are categorized as either inseparably combined or as supporting research on women's health only or men's health only. As a step toward establishing uniform procedures for determining the appropriate categorical allocations, and based upon discussions of the CCWH and the NIH Coordinating Committee on Research on Women's Health, general guidelines for budget calculations are provided below:

1. All funding for projects that focus primarily on women, such as the Nurses' Health Study, the Mammography Quality Standards Act, and the Women's Health Initiative, should be attributed to women.
2. For research, studies, services, or projects that include both men and women, recommended methods to calculate the proportion of funds spent on women's health are as follows:
 - a. If target or accrual enrollment data are available, multiply the expenditure by the proportion of female subjects included in the program. For example, if 50 percent of the subjects enrolled in a trial, study, service, or treatment program are women, then 50 percent of the funds spent for that program should be counted as for women's health.

On the other hand, for diseases, disorders, or conditions without enrollment data, expenditures can be calculated based on the relative prevalence of that condition in women.

- b. Where both men and women are included, as may be the case for many basic science research projects, multiply the expenditure by 50 percent.

Although each IC applied the criteria according to its discretion and judgment, ORWH, along with its advisory and coordinating committees, continues to monitor potential inconsistencies in the evolving methodology for collecting budget data and will provide input to the HHS CCWH's efforts to develop best methods for future budget data collection.

Table 1 lists the overall NIH research expenditures in FY 2013 and FY 2014 for specific diseases, disorders, and conditions by women only and men only and for both women and men. The health categories and subcategories in this table were developed to accommodate all agencies in HHS. Certain subcategories are not applicable to the

NIH mission; for those subcategories, the table will show a zero across all columns. In some cases, however, a zero may be shown even when the subcategory is relevant. This occurs because the table is additive. Funding included in each budget allocation may be listed only once, even though conceptually it applies to more than one category. For example, expenditures on infertility in cancer survivors could apply to infertility or cancer. In this example, the IC would determine the most scientifically appropriate category. Furthermore, amounts listed for each specific topic area are likely to underestimate the total expenditures for a given topic area because no overlap in reporting is allowed by the prescribed method of data collection for this report. In contrast, as required by the 2006 NIH Reform Act, NIH as a whole uses a computerized, text mining process to categorize and report funding in more than 233 diseases and conditions. Known as the Research, Condition, and Disease Categorization (RCDC) process, the approach allows projects to be counted in more than one category, thereby capturing the overlapping nature of the science.

Table 1. HHS–NIH Research Budget for Women’s and Men’s Health by Disease, Condition, and Special Initiatives, FY 2013 and FY 2014 (Dollars in Thousands)^{1,2}

Disease, Condition, or Initiative	FY 2013 Women	FY 2013 Men	FY 2013 Both	FY 2013 Total	FY 2014 Women	FY 2014 Men	FY 2014 Both	FY 2014 Total
I. Cancer								
Breast cancer (including mammography and other services)	620,997	338	5,617	626,952	705,090	68	1,430	706,588
Reproductive cancers:								
Cervical	68,205	1,781	6,790	76,776	84,966	1,108	6,700	92,774
Ovarian	108,507	9	487	109,003	111,573	0	0	111,573
Vaginal, uterine, and other	24,932	0	127	25,059	25,489	0	0	25,489
Lung cancer	132,811	50	180,056	312,917	150,678	230	119,998	270,906
Colorectal cancer	114,531	761	158,180	273,472	131,348	231	129,825	261,404
Other neoplasms	31,055	70,075	3,745,637	3,846,767	37,816	77,829	3,752,697	3,868,342
Subtotal	1,101,038	73,014	4,096,894	5,270,946	1,246,960	79,466	4,010,650	5,337,076

¹ These data are exclusive of overlap and will not agree with funding reported for total NIH spending on disease areas.

² Figures shown in this table do not include NIH Buildings and Facilities program spending.

Disease, Condition, or Initiative	FY 2013 Women	FY 2013 Men	FY 2013 Both	FY 2013 Total	FY 2014 Women	FY 2014 Men	FY 2014 Both	FY 2014 Total
II. Cardiovascular/Pulmonary								
Blood diseases	40,580	55,544	381,913	478,037	37,646	47,807	415,524	500,977
Heart disease	133,560	132,519	660,922	927,001	125,873	121,968	790,991	1,038,832
Stroke	18,457	35,706	186,234	240,397	12,941	33,312	203,415	249,668
Other cardiovascular diseases/disorders	129,346	108,451	707,695	945,492	132,560	102,727	791,654	1,026,941
Pulmonary diseases	95,384	80,044	507,287	682,715	82,792	83,493	333,214	499,499
Asthma	48,414	29,176	129,539	207,129	49,078	48,546	128,323	225,947
Other	1,384	49	323,407	324,840	309	50	341,896	342,255
Subtotal	467,125	441,489	2,896,998	3,805,612	441,199	437,903	3,005,017	3,884,119

III. Reproductive and Maternal/Child/Adolescent Health								
Contraception	25,500	4,768	48,344	78,612	21,067	10,348	55,243	86,658
Infertility	2,535	3,133	10,350	16,018	2,852	2,967	7,476	13,295
Female reproductive physiology	72,945	605	7,570	81,120	64,968	0	0	64,968
Hysterectomy	0	0	0	0	103	0	0	103
Endometriosis/leiomyomas (fibroids)	7,883	0	5,562	13,445	8,238	0	417	8,655
Pregnancy/pregnancy prevention/maternal health	224,971	399	5,169	230,539	225,407	741	14,663	240,811
Diseases related to diethylstilbestrol exposure	0	0	0	0	100	0	0	100
Female genital cutting	38	38	0	76	0	0	0	0
Pelvic floor disorders	2,503	0	0	2,503	1,223	0	0	1,223
Other	2,373	8,612	525,747	536,732	2,648	10,901	484,969	498,518
Subtotal	338,748	17,555	602,742	959,045	326,606	24,957	562,768	914,331

IV. Aging								
Menopause	23,939	0	0	23,939	24,945	0	200	25,145
Menopausal hormone/nonhormone therapy	7,323	0	0	7,323	7,017	0	0	7,017
Alzheimer's disease	83,503	66,346	236,874	386,723	106,729	88,825	304,141	499,695
Malnutrition in the elderly	71	48	0	119	68	46	0	114
Osteoarthritis	33,999	2,395	54,816	91,210	40,592	2,124	53,994	96,710
Osteoporosis (including fractures)	95,183	2,203	15,933	113,319	88,553	7,214	10,956	106,723
Women's Health Initiative	0	0	0	0	0	0	0	0
Demography of aging	16,995	14,348	7,664	39,007	28,067	23,224	0	51,291
Aging economics	13,352	11,731	18,068	43,151	20,751	18,001	10,355	49,107
Other	30,527	16,304	342,211	389,042	127,076	122,356	506,881	756,313
Subtotal	304,892	113,375	675,565	1,093,832	443,798	261,790	886,527	1,592,115

Disease, Condition, or Initiative	FY 2013 Women	FY 2013 Men	FY 2013 Both	FY 2013 Total	FY 2014 Women	FY 2014 Men	FY 2014 Both	FY 2014 Total
V. Metabolism, Endocrinology, and Gastrointestinal								
Diabetes	101,473	73,376	99,813	274,662	106,607	76,701	88,563	271,871
Obesity	158,228	91,615	100,988	350,831	167,543	96,651	101,543	365,737
Hepatobiliary diseases	2,138	3,154	230,814	236,106	2,070	3,104	243,195	248,369
Thyroid diseases/conditions	11,595	2,504	0	14,099	11,184	2,796	0	13,980
Fecal incontinence	1,148	128	182	1,458	1,179	131	0	1,310
Irritable bowel syndrome	7,225	803	1,086	9,114	7,962	815	749	9,526
Other	1,548	384	116,503	118,435	1,468	1,257	120,046	122,771
Subtotal	283,355	171,964	549,387	1,004,706	298,013	181,455	554,096	1,033,564
VI. Substance Abuse								
Etiology (<i>unspecified</i>)	6,806	7,767	81,765	96,338	7,238	8,147	92,974	108,359
Epidemiology (<i>unspecified</i>)	29,053	28,718	56,265	114,036	28,605	28,385	68,998	125,988
Prevention (<i>unspecified</i>)	23,526	23,326	37,845	84,697	25,068	25,196	38,596	88,860
Treatment (<i>unspecified</i>)	67,811	71,718	124,015	263,544	73,488	79,171	135,100	287,759
Alcohol	19,518	22,484	109,927	151,929	20,096	22,693	113,472	156,261
Illegal drugs	127,785	131,188	222,109	481,082	125,522	129,360	221,170	476,052
Prescription drugs	7,781	8,145	13,979	29,905	9,778	10,246	17,804	37,828
Tobacco products	28,303	29,265	71,382	128,950	27,819	28,547	70,636	127,002
Other substances	446	673	5,092	6,211	620	810	288	1,718
Co-occurring substance abuse and mental disorders	599	719	3,218	4,536	1,092	583	4,355	6,030
Subtotal	311,628	324,003	725,597	1,361,228	319,326	333,138	763,393	1,415,857
VII. Behavioral Studies/Programs								
Violence (<i>including domestic, abused women, spouse abuse, elder abuse, violence against women, trafficking, and bullying</i>)	3,451	1,804	20,684	25,939	4,316	1,710	16,688	22,714
Tobacco use cessation	167	101	3,015	3,283	119	54	2,613	2,786
Physical activity/exercise/nutrition (<i>promoting healthy behavior</i>)	18,628	8,893	201,444	228,965	1,812	1,419	223,552	226,783
Other behavior change/risk modification	14,732	5,165	452,431	472,328	16,524	6,787	458,402	481,713
Caregiving	6,413	2,345	10,493	19,251	584	0	13,466	14,050
Other	21,705	19,084	392,548	433,337	6,755	3,208	391,132	401,095
Subtotal	65,096	37,392	1,080,615	1,183,103	30,110	13,178	1,105,853	1,149,141

Disease, Condition, or Initiative	FY 2013 Women	FY 2013 Men	FY 2013 Both	FY 2013 Total	FY 2014 Women	FY 2014 Men	FY 2014 Both	FY 2014 Total
VIII. Mental Health								
Etiology (<i>unspecified</i>)	84	84	24,853	25,021	1,208	1,586	27,223	30,017
Epidemiology (<i>unspecified</i>)	0	0	112	112	0	0	141	141
Prevention (<i>unspecified</i>)	0	0	1,184	1,184	69	69	1,278	1,416
Treatment (<i>unspecified</i>)	137	122	2,104	2,363	564	167	2,387	3,118
Depression/mood disorders	17,089	2,693	130,255	150,037	20,219	2,708	118,513	141,440
Suicide	1,263	631	17,313	19,207	1,722	521	21,421	23,664
Schizophrenia	528	257	109,985	110,770	1,250	164	105,941	107,355
Anxiety disorders	624	385	34,528	35,537	1,520	1,139	36,092	38,751
Eating disorders	4,994	0	6,581	11,575	4,924	0	6,315	11,239
Psychosocial stress	9,986	2,575	19,824	32,385	6,129	865	20,795	27,789
Posttraumatic stress disorder	3,886	1,352	17,066	22,304	4,619	1,632	14,769	21,020
Other mental disorders (<i>excluding Alzheimer's</i>)	26,553	8,292	746,894	781,739	29,492	6,861	785,962	822,315
Autism	2,881	28,518	79,870	111,269	3,672	30,433	86,212	120,317
Subtotal	68,025	44,909	1,190,570	1,303,504	75,388	46,145	1,227,049	1,348,582

IX. Infectious Diseases								
AIDS/HIV	177,296	55,003	2,246,153	2,478,452	167,978	71,539	2,228,561	2,468,078
Tuberculosis	10,098	7,677	152,402	170,177	9,171	21,381	151,652	182,204
Sexually transmitted diseases	41,648	3,771	156,467	201,886	35,506	19,560	140,368	195,434
Topical microbicides	53,330	3,684	39,584	96,598	91,246	0	7,957	99,203
Toxic shock syndrome	694	0	0	694	397	0	0	397
Tropical diseases (<i>including malaria</i>)	30,097	4,465	454,062	488,624	29,708	22,723	422,666	475,097
Other	2,560	1,210	661,565	665,335	1,523	822	650,482	652,827
Subtotal	315,723	75,810	3,710,234	4,101,767	335,529	136,025	3,601,686	4,073,240

X. Immune Disorders								
Rheumatoid arthritis	35,347	120	124,238	159,705	33,628	0	133,934	167,562
Lupus erythematosus	40,474	2,759	36,008	79,241	44,836	4,669	27,151	76,656
Multiple sclerosis	7,468	12,210	72,149	91,827	5,672	11,072	66,929	83,673
Myasthenia gravis	0	0	0	0	0	0	0	0
Scleroderma	10,044	0	8,034	18,078	12,336	102	2,441	14,879
Sjögren's syndrome	19,089	174	717	19,980	17,458	0	375	17,833
Takayasu disease	0	0	0	0	0	0	0	0
Other	7,816	5,644	215,878	229,338	517	396	184,372	185,285
Subtotal	120,238	20,907	457,024	598,169	114,447	16,239	415,202	545,888

Disease, Condition, or Initiative	FY 2013 Women	FY 2013 Men	FY 2013 Both	FY 2013 Total	FY 2014 Women	FY 2014 Men	FY 2014 Both	FY 2014 Total
XI. Neurologic, Muscular, and Bone								
Trauma research								
Brain	9,137	20,531	175,711	205,379	7,867	21,501	187,435	216,803
Other neurologic trauma	0	0	16,338	16,338	0	0	18,396	18,396
Bone fracture (<i>non-osteoporotic</i>) and muscle injury	19	77	16,060	16,156	51	112	16,429	16,592
Muscular dystrophy	1,675	33,205	30,258	65,138	1,469	36,523	26,686	64,678
Chronic pain conditions	9,835	15,397	123,507	148,739	3,948	10,500	120,601	135,049
Temporomandibular disorders	15,085	0	2,251	17,336	17,122	0	78	17,200
Vulvodynia	2,681	0	219	2,900	2,086	0	333	2,419
Fibromyalgia and eosinophilic myalgia	3,615	0	49	3,664	3,652	0	0	3,652
Migraine	17	17	669	703	50	50	856	956
Sleep disorders	8,398	9,826	49,649	67,873	2,269	4,501	44,062	50,832
Paget's disease	0	0	1,042	1,042	0	0	1,377	1,377
Parkinson's disease	7,840	16,397	98,393	122,630	6,264	15,985	95,055	117,304
Seizure disorders	7,713	17,479	85,114	110,306	7,406	20,208	100,651	128,265
Other	64,742	128,886	1,067,371	1,260,999	44,648	123,438	1,010,494	1,178,580
Subtotal	130,757	241,815	1,666,633	2,039,205	96,832	232,818	1,622,453	1,952,103
XII. Kidney and Urologic								
Urinary tract infections (<i>cystitis, pyelonephritis</i>)	6,260	1,066	15,681	23,007	6,018	677	14,418	21,113
End-stage renal disease/transplantation	2,281	2,527	77,135	81,943	2,057	6,045	91,634	99,736
Urinary incontinence	9,856	456	251	10,563	7,772	0	0	7,772
Painful bladder, interstitial cystitis	9,030	1,067	0	10,097	9,345	1,238	0	10,583
Other	579	7,745	449,226	457,550	1,438	5,845	407,939	415,222
Subtotal	28,006	12,861	542,293	583,160	26,630	13,805	513,991	554,426
XIII. Ophthalmic, Otolaryngologic, and Oral Health								
Eye diseases and disorders	28,073	13,193	677,772	719,038	27,696	12,668	693,979	734,343
Ear diseases and disorders	17,193	1,463	202,788	221,444	12,514	7	215,658	228,179
Dental and oral health	1,273	1,329	338,663	341,265	2,147	599	341,598	344,344
Other	0	0	446	446	0	0	1,099	1,099
Subtotal	46,539	15,985	1,219,669	1,282,193	42,357	13,274	1,252,334	1,307,965

Disease, Condition, or Initiative	FY 2013 Women	FY 2013 Men	FY 2013 Both	FY 2013 Total	FY 2014 Women	FY 2014 Men	FY 2014 Both	FY 2014 Total
XIV. Health Effects of the Environment								
Environmental estrogens	10,816	1,106	16,774	28,696	10,736	1,327	16,772	28,835
Health effects of toxic exposure (excluding cancer)	425	28	158,061	158,514	350	350	132,880	133,580
Toxicological research and testing program	0	0	97,482	97,482	0	0	94,610	94,610
Chemical/biological warfare agents	0	0	1,919	1,919	0	0	1,366	1,366
Other	12	0	3,923	3,935	50	50	5,440	5,540
Subtotal	11,253	1,134	278,159	290,546	11,136	1,727	251,068	263,931
XV. Cross Cutting Categories and Special Initiatives								
Treatment, prevention, and services	2,994	6,449	327,352	336,795	4,095	10,727	301,229	316,051
Access to health care and financing	1,117	631	111,731	113,479	376	134	130,185	130,695
Education and training for health care providers	8,463	515	70,377	79,355	11,316	2,077	85,524	98,917
Health literacy and bilingual information	1,248	645	26,162	28,055	773	276	24,666	25,715
Cultural influences	1,641	1,321	27,923	30,885	2,005	1,390	52,673	56,068
Disability research and services	1,651	1,498	82,169	85,318	0	517	105,734	106,251
Homelessness	494	570	717	1,781	103	303	392	798
Chronic fatigue syndrome	1,439	859	982	3,280	1,668	790	632	3,090
Breast feeding	408	0	257	665	0	0	0	0
Organ donation	0	0	813	813	0	0	792	792
Genetic services/counseling	741	738	2,170	3,649	11,052	8,339	5,128	24,519
Unintentional injury	3,820	3,233	23,116	30,169	230	636	24,257	25,123
Alternative and complementary therapies	38,286	22,844	109,445	170,575	36,271	24,841	109,364	170,476
Health statistics and data collection	690	556	45,400	46,646	1,022	737	59,481	61,240
Programs/Offices on/of Women's Health	65,512	277	1,275,769	1,341,558	44,736	9,109	1,469,748	1,523,593
Global health	22,204	4,792	1,675,930	1,702,926	11,509	67,485	1,788,623	1,867,617
Drug metabolism (sex differences, pregnancy, etc.)	2,199	1,435	23,461	27,095	1,292	279	6,076	7,647
Other cross-cutting ³								
Subtotal	152,907	46,363	3,803,774	4,003,044	126,448	127,640	4,164,504	4,418,592
Total	3,745,330	1,638,576	23,496,154	28,880,060	3,934,779	1,919,560	23,936,591	29,790,930

³ Category is no longer valid. Programs/Offices on/of Women's Health acts as a replacement.



Table 2 shows the dollar amounts and percentages of the NIH research budget in FY 2013 and FY 2014 for women only and for men only. Overall, the proportion of the research budget supporting women only was 13.0 percent and 13.2 percent for FY 2013 and FY 2014, respectively.

Of interest is that the proportion of the research budget supporting men only was 5.7 percent and 6.4 percent for FY 2013 and FY 2014, respectively, which likely reflects the implicit bias in the data categories on diseases, conditions, or disorders relevant to women or occurring only in women.

Table 2. FY 2013 and FY 2014 Summary: NIH Research Budget by Sex (Dollars in Thousands)

Category	FY 2013, \$	FY 2014, \$	FY 2013, %	FY 2014, %
Women	3,745,330	3,934,779	13.0	13.2
Men	1,638,576	1,919,560	5.7	6.4
Both	23,496,154	23,936,591	81.4	80.3
Total	28,880,060	29,790,930	100	100.0

Reference

NIH Reform Act of 2006, H.R. 6164, 109th Congress. (2007).

