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Research on Menopause



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Director's Corner

Janine Austin Clayton, M.D., FARVO
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This issue of In Focus explores the menopausal transition, an often-overlooked stage of a woman's life that generally begins between ages 45 and 55 and ends at menopause, marked by a woman's final menstrual period. Many women experience menopausal symptoms—hot flashes, sleep interruptions, and others—and all will undergo physiological changes throughout this transition. Over the past several decades, NIH has supported several major research initiatives on menopause, notably the Women's Health Initiative (WHI) and the Study of Women's Health Across the Nation (SWAN), which have enriched our understanding of this pivotal life stage. However, many knowledge gaps and research questions about menopause remain.

We discuss menopausal symptoms and past, ongoing, and future NIH research on menopause in our feature story. Two articles in the "In the Journals" section ("Study Re-evaluates Risks and Benefits of Menopausal Hormone Therapy for Women Ages 50–59" on p. 10 and "SWAN Evaluates Physical Function Among Racial and Ethnic Groups of Midlife Women" on p. 11) summarize recent research following up on findings of the seminal WHI and SWAN.

We also highlight two important developments in research pertaining to biological sex and sex differences. "Researchers Identify Sex- and Species-Dependent Pain Biomechanisms" (p. 11) discusses the discovery of sex-specific gene expression in pain-sensitive neurons of mice, humans, and nonhuman primates. A second article, "Researchers Use CRISPR Gene Editing to Produce Single-Sex Litters of Mice" (p. 14), touches on promising new techniques and efficiencies for sex-specific laboratory animal research. Other stories discuss topics relevant to women in biomedical careers and the effects of the pandemic on those careers.

I'll conclude with an important reminder to get vaccinated against COVID-19 and receive all booster shots [recommended by the Centers for Disease Control and Prevention](#). Also, please share this issue of In Focus with your colleagues and subscribe by clicking the link on the front or back cover. Stay safe and be well!

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NIH Supports Research on Menopause

Menopause begins after a woman's last menstrual cycle. As the frequency of menses can become irregular in the months and years preceding menopause, clinical guidelines recommend confirming this date retrospectively after 12 months with no periods.¹ Perimenopause, the transitional period leading up to this time, usually begins between ages 45 and 55 and lasts several years. Worldwide, over 27 million women—and other individuals born with a uterus and ovaries—experience menopause each year.² Most women, though not all, experience mild, moderate, or disruptive menopausal symptoms, such as sleep disturbances and the well-known hot flashes. With or without these symptoms, the menopausal transition involves many changes in a woman's physiology and often her health status as well.

Multiple biological and social factors—including genetics, race, ethnicity, smoking history, stress, diet, exercise, and environment—contribute to the age of onset of menopause (median age = 51). Early menopause sometimes occurs, and some women begin their natural menopausal transition in their 30s or early 40s. Certain medical interventions—such as surgical removal of the ovaries, pelvic radiation, and exposure to some medications (including many cytotoxic chemotherapy agents)—may also result in early menopause. Chronological age and the menopausal hormonal environment interact in many ways to affect health.

Midlife, which usually coincides with the menopausal transition, often marks the onset of many chronic diseases. During the menopausal transition, a woman's changing endogenous hormone environment can affect her lipid profiles, weight, body mass index, and bone density—all of which influence health status. Women's risks for heart disease and osteoporosis increase at menopause, and the timing of the onset of the menopausal transition may predict risk for later-life health problems such as cardiovascular disease and Alzheimer's disease. As such, menopause constitutes a pivotal moment for delaying, preventing, or ameliorating chronic disease. Increasingly, clinicians and researchers are recognizing that the onset of the transition and progression of menopause—and menstruation in general—represent vital signs akin to blood pressure and body temperature. These vital signs can inform biomedical research and health care for individual women.



Michelle M. Mielke, Ph.D.

"You sometimes hear that menopause is a 'risk factor' for certain health conditions," says [Michelle M. Mielke, Ph.D.](#) "However, it's more accurate to say that menopause, like pregnancy, is a 'stress test' that can help us predict later-life health concerns and identify predispositions for disease." Dr. Mielke is a women's health researcher, Chair of the Department of Epidemiology and Prevention at the Wake Forest University School of Medicine, and Co-Director of the Mayo Clinic center of the ORWH-supported Specialized Centers of Research Excellence on Sex Differences ([SCORE](#)) program. She emphasizes that menopause itself is not a disease but a natural

life stage that essentially all women who live to midlife will experience. Establishing a comprehensive knowledge base about the menopausal transition and the interventions that can ease its symptoms represents an important step in promoting healthy aging, informing preventive health care, and improving women's health.

NIH recognizes the importance of the menopausal transition to women's health and, through several past and ongoing studies, supports comprehensive research to

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improve our understanding of this life stage and its implications for later-life health. Below, we review the menopausal transition and its symptoms and describe some important NIH-supported menopause-related studies.

The Menopausal Transition

Throughout the menopausal transition, the ovaries become less efficient at producing estrogen and progesterone, hormones that circulate throughout the body and affect the reproductive organs, other organ systems, and some aspects of aging. This shift in circulating hormones and other effects of midlife aging result in profound physiological and neurocognitive changes. During this transition, perimenopausal women may experience some, all, or none of the following changes and symptoms.

Menstrual Changes. As they approach menopause and the complete cessation of menstruation, most women will experience menstrual changes, such as shorter or less frequent periods. Heavier or more frequent menses may indicate an underlying problem and should be evaluated.

Vasomotor Symptoms. Physiological changes associated with hormonal changes can affect vasomotor functions (i.e., those that control the contraction of blood vessels), resulting in hot flashes, night sweats, flushing or blotchiness of the skin, sweating, and subsequent shivering. Hot flashes can last for 30 seconds to 10 minutes and may occur as often as several times an hour or as infrequently as less than once a week.

Sleep Disturbances. Women may experience insomnia, poor-quality sleep, or interrupted sleep. Night sweats may contribute to sleep disturbances. However, recent research suggests that the reverse may be the case and that sleeplessness may instead trigger hot flashes.³

Mood Changes. Many perimenopausal women experience moodiness, irritability, or depressive symptoms, all



of which can also contribute to or be triggered by sleep disturbances. The mechanisms behind these symptoms remain unknown.

Brain and Cognitive Changes. Some women may experience forgetfulness during or shortly after the menopausal transition. Research has shown that the first year after menopause is associated with poorer cognitive function, after which these small cognitive losses tend to resolve.⁴ Some experts have suggested that these short-term cognitive losses may result, at least in part, from poor sleep quality. Other research has demonstrated that menopause changes brain structure, connectivity, energy metabolism, and amyloid-beta deposition, all of which could affect cognition.

Body Changes. Perimenopause may influence multiple physiological processes, including energy utilization, possibly resulting in weight gain, loss of muscle, and increased abdominal fat. Changes can also occur in the skin, joints, lipid and lipoprotein profiles, bones, and heart.⁵ Stiffness and achiness are common, and some women experience headaches and heart palpitations. Some of these symptoms are part of the natural aging process.

Chronic Diseases. For many, the menopausal transition marks the onset and accumulation of chronic diseases such as hypertension and diabetes (as

well as associated insulin resistance, hyperglycemia, and accumulation of abdominal fat).

Bladder Control. Some women experience incontinence, sudden urges to urinate, or urine leaking during exertion, sneezing, or laughing.

Changes in Sexual Function. Perimenopausal and postmenopausal women may experience changes in sexual desire; vaginal dryness, burning, or itching; tightening of the vaginal opening; or pain during sex.

Menopausal symptoms are unpredictable. Many relate to endogenous hormone levels, which can vary widely and often throughout the transition. Other factors may also influence the duration, severity, and type of symptoms experienced. Most symptoms resolve in time, and interventions can relieve many of them. Lifestyle changes, over-the-counter and prescription medications, lubricants and moisturizers, and prescription hormone therapies can mitigate many menopausal symptoms. ORWH encourages health care providers and perimenopausal women to discuss menopausal symptoms and treatment options openly and frankly. (See also *Resources on Menopause* on p. 5 for links to practical health tips and additional information.)

Menopause is confirmed 12 months after a woman's final menstrual period. Postmenopausal women have an increased risk of osteoporosis, cardiovascular disease, cancers, and other health problems. A healthy diet, an appropriate intake of calcium, exercise, and regular visits to health care providers can improve overall wellness and foster healthy aging in postmenopausal women. Please make sure to check with a physician before beginning an exercise regimen.

NIH Studies on Menopause

Over the past few decades, NIH has developed and supported several major research initiatives—as well as

many smaller projects—to improve our understanding of menopause and its impact on the health of midlife and older women. As menopause intersects with many aspects of human health, several NIH Institutes, Centers, and Offices have contributed to these efforts, including the National Heart, Lung, and Blood Institute ([NHLBI](#)), the National Institute on Aging ([NIA](#)), the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development ([NICHD](#)), ORWH, and others. NIH’s menopause-related studies have illuminated our understanding of this important life stage and improved women’s health care. However, many questions and gaps in our understanding of menopause remain, and NIH will continue to support menopause-related studies as part of its ongoing effort to expand biomedical research on the health of women as well as midlife and older adults. (See *Questions for Current and Future Menopause-Related Research* on p. 6.)

The Women’s Health Initiative. In 1991, NHLBI launched the Women’s Health Initiative ([WHI](#)), one of the largest women’s health projects in history. Former NIH Director [Bernadine Healy, M.D.](#), led the development of the WHI, a long-term national health study geared toward improving the health of postmenopausal women of all races and socioeconomic backgrounds. WHI researchers enrolled over 161,000 women study participants at 40 clinical centers across the country. The WHI’s primary goals included preventing heart disease, breast and colorectal cancers, osteoporosis, and other diseases common among postmenopausal women. The WHI included a randomized controlled clinical trial with more than 68,000 postmenopausal women, an observational study tracking the medical histories and health habits of more than 93,000 women, and a community prevention study.

About 20 years ago, some of the WHI’s findings suggested that estrogen–

progesterin hormone therapy for postmenopausal women increased the risk of some cancers, stroke, blood clots, heart disease, and other health problems. These results prompted WHI researchers to halt several arms of the clinical trial, and the use of hormone replacement therapy to treat menopausal symptoms dropped dramatically after the publication of these findings.

“After the WHI, there was a major decline in the use of hormone therapy for all women. WHI results suggested that the increased risk of stroke, cardiovascular disease, and dementia primarily occurred in women who initiated

hormone therapy 10–15 years after menopause,” says Dr. Mielke. “Problems seem to emerge when hormones are reintroduced to the body after it has acclimated to their absence.”

However, some investigators, noting that many WHI study participants were 60 or older, hypothesized that hormone therapies could benefit younger women closer to the menopausal transition without the health risks. More recent studies, such as the Kronos Early Estrogen Prevention Study ([KEEPS](#))⁶ and others,^{7,8} support this hypothesis. For instance, KEEPS researchers found that for women at low risk for cardiovascular disease and within 3 years of their last

Resources on Menopause

Several Federal agencies and other organizations have comprehensive resources for women, scientists, researchers, and other interested parties. ORWH recommends the following reliable sources of information and tools.

- NIA’s [menopause webpage](#) contains a wealth of information and practical advice for perimenopausal women.
- NICHD’s [menopause webpage](#) provides general information on the menopausal transition and describes several in-progress research efforts.
- The Food and Drug Administration’s (FDA) [menopause webpage](#) lists general health information on menopause and describes current FDA-approved hormone therapies and nonhormonal medications, as well as nonprescription dietary supplements, herbs, and other natural products. Women considering medication for menopausal symptoms may also find FDA’s downloadable booklet [Menopause: Medicines to Help You](#) informative.
- Several NIH webpages also provide information on hormone therapy, including [Menopausal Hormone Therapy Information, Hot Flashes: What Can I Do? \(NIA\)](#), and [Hormone Replacement Therapy \(National Library of Medicine\)](#).
- For accurate general information on the menopausal transition, see the menopause-related webpages of the [HHS Office on Women’s Health](#) and the [Endocrine Society](#) as well as the [website of the North American Menopause Society](#).
- The [website of the American College of Obstetricians and Gynecologists](#) includes medical information on menopause for physicians and researchers.
- Many downloadable apps and websites specific to menopause (e.g., [MenoPro](#), [My Menoplan](#), and [Caria](#)) can help women track, monitor, and evaluate their menstrual cycles and perimenopausal symptoms. Be sure to choose one from a legitimate medical organization. Note that some apps provide anonymized data to research institutions for use in biomedical studies.

Questions for Current and Future Menopause-Related Research

The WHI, SWAN, the other NIH-supported studies described here, and numerous other research efforts have elucidated the menopausal transition and informed health care for women. However, many knowledge gaps remain. Ongoing and future research may explore:

- How to optimize the duration, delivery methods, formulations, doses, safety, and efficacy of menopausal hormone therapy for women seeking treatment for perimenopausal symptoms and what alternative therapies might prove safe and effective;
- How health care strategies, assessments, and treatments of perimenopausal women can promote healthy aging;
- Why women experience varying severities of hot flashes, sleep disturbances, and other menopausal symptoms or no symptoms;
- How menopausal symptoms predict later-life health;
- How race, ethnicity, and other demographic factors are associated with menopause;
- How the menopausal transition and chronological aging, separately and together, influence midlife and later-life health;
- How to promote more open discussion and awareness about menopause among women, clinicians, and the general population;
- How the menopausal experiences, symptoms, and long-term health effects of women who have had hysterectomies and/or oophorectomies, many of whom were excluded from initial menopause-related study cohorts, differ from those of women who have not;
- How levels of endogenous or exogenous (from hormone therapies or hormone birth control) sex hormones across the life course relate to overall health and disease risk;
- How environmental factors may alter the natural history of menopause and aging and the risk of disease;
- How technologies such as the NIH-supported [EVATAR](#) model of a female reproductive system can help researchers learn more about reproductive aging; and
- Many other biomedical questions.

period, estrogen therapies can reduce hot flashes, night sweats, and insulin resistance and can improve sleep, mood, and sexual function with no bone density loss or major adverse cardiovascular or cognitive events.⁶

Dr. Mielke adds, “Recent studies have shown that hormone therapy can reduce menopausal symptoms and improve quality of life. If taken for a limited

amount of time and initiated within 3 years of the menopausal transition, hormone therapy will not increase health risks for most women.” Hormone therapy remains contraindicated for women with cardiovascular disease as well as other health conditions or predispositions.

Data collection for the original WHI study concluded in 2005, though multiple extension and secondary

studies followed and continue to this day. One extension study followed WHI participants through 2020 and focused on cardiovascular events and aging. Two studies—the Objective Physical Activity and Cardiovascular Health ([OPACH](#)) study and the WHI Strong and Healthy ([WHISH](#)) study—have explored the health benefits of exercise for older women and of tracking their physical activity with wearable biometric devices. The WHI Sleep Hypoxia Effects on Resilience ([WHISPER](#)) study investigates the relationship between sleep-disordered breathing (e.g., sleep apnea) and adverse cardiovascular events.

Overall, the WHI improved our knowledge base on the health of older women and dramatically reduced the incidence of breast cancer and cardiovascular disease among postmenopausal women. The scientific information gained from the hormone trials alone has helped save the United States an estimated \$35.2 billion in direct medical costs.⁹

The Study of Women’s Health Across the Nation. The NIH-sponsored Study of Women’s Health Across the Nation ([SWAN](#)) began a quarter-century ago as a longitudinal epidemiological study of women’s health through their middle years. This ongoing study involves multiple U.S. research centers and a cohort of over 3,300 premenopausal women who were ages 42–52 when first enrolled and who participate in annual follow-ups with SWAN researchers. SWAN examines the physical, biological, psychological, and social changes occurring throughout midlife, with particular emphasis on the menopausal transition.

[Siobán D. Harlow, Ph.D.](#), has served as one of SWAN’s organizers and leading researchers since its inception. She was the Principal Investigator of the SWAN center at the University of Michigan from 2011 to 2021. From 2012 to 2018, Dr. Harlow was also the Principal Investigator of the SWAN Repository, a vast collection of SWAN data and



**Siobán D. Harlow,
Ph.D.**

biospecimens that was later incorporated into the [NIA AgingResearchBiobank](#). Dr. Harlow was also a Principal Investigator of the [ReSTAGE collaboration](#),¹⁰ an empirical re-evaluation of the 2001 Stages of Reproductive Aging Workshop (STRAW).¹¹ STRAW and ReSTAGE standardized the nomenclature and clinical criteria for classifying women's reproductive stage and for predicting menopausal age.

"SWAN recruited a multiethnic cohort of African American, Chinese, Japanese, Latina, and White women," says Dr. Harlow. "Since 1996, we have followed this cohort through menopause and observed the changes in their menstrual patterns, reproductive hormones, and symptoms to better understand the natural history of reproductive aging, something we knew little about when SWAN began." Dr. Harlow explains that SWAN researchers have taken a multidomain approach to track participants' mental, cardiometabolic, and musculoskeletal health; physical and cognitive function; sleep quality; and overall well-being.¹²

"A key goal of SWAN has been to understand the contribution of chronological aging, as opposed to reproductive aging, in women's symptom experience and health in midlife," Dr. Harlow says. SWAN researchers have found that cardiovascular health is more strongly associated with menopause and reproductive aging than with chronological aging.¹³ Similarly, SWAN investigators discovered that the durations of a woman's menstrual cycles through perimenopause, which correlate to hormone levels, predict later-life

arterial wall thickness.¹³ Chronological aging, however, has a greater effect on changes in blood pressure and body mass index.¹⁴

Dr. Harlow adds, "SWAN researchers have also prioritized racial and ethnic health disparities among midlife women." For instance, African American women bear a much greater disease burden than White women as they enter midlife. "Gaining a better understanding of the differential timing of health risks as well as the variations in risk profiles across different populations is critical to targeting appropriate interventions as women age," Dr. Harlow says. By disaggregating data by race and ethnicity in their analyses, SWAN researchers have found extensive racial and ethnic differences in midlife and postmenopausal women in regard to cardiovascular disease risk, arterial wall thickness, arterial stiffness, blood vessel diameter, arterial plaque, and other health indicators.^{15,16}

SWAN research continues, and investigators regularly publish new findings. Dr. Harlow states, "The women in the SWAN cohort are now postmenopausal and transitioning into early old age. We are now exploring how menopausal characteristics and women's midlife health experiences influence function and well-being in later life." For instance, ongoing SWAN research is exploring the midlife onset of chronic diseases and disability and how they manifest later in life as well as possible connections between menopausal symptoms and problems at older ages, such as declining cognitive function, declining balance, urinary incontinence, and fracture risk. SWAN investigators are also tracking the COVID-19 pandemic to determine its effects on the health and functioning of study participants; to ascertain the effects of the pandemic and mitigation efforts on economic security, social engagement, health behaviors, and health and functioning outcomes; and to gauge the effects of COVID-19-related delays in receiving medical care on health.

"The depth and breadth of SWAN's longitudinal data and the large biospecimen repository are remarkable scientific resources and will continue to help us understand reproductive aging and midlife health," says Dr. Harlow. "However, we have much more to learn to improve women's health and experience as they age."

MsFLASH and MsBRAIN. Two NIA-funded studies—the Menopause Strategies: Finding Lasting Answers for Symptoms and Health ([MsFLASH](#)) trials and Menopausal Vasomotor Symptoms and Brain Aging in Women ([MsBRAIN](#))—explore, respectively, treatment of the physical symptoms of menopause and the transition's effects on brain health.

In 2008, six MsFLASH academic research centers began examining current and new treatments for menopausal symptoms. MsFLASH researchers have conducted five clinical trials with women ages 40–70 and tested interventions such as antidepressants, yoga, exercise, omega-3 supplements, and telephone-based cognitive behavioral therapy.¹⁷ Some study participants receiving these interventions have experienced beneficial effects, such as fewer hot flashes, less pain, fewer depressive symptoms, better sleep quality, and an improved quality of life.¹⁸ However, MsFLASH interventions have demonstrated little to no effect on midlife bone loss or postmenopausal vaginal symptoms and mixed results on sexual function.¹⁸

NIA's ongoing MsBRAIN study explores how menopausal symptoms affect short- and long-term brain health and how menopause and chronological aging have different effects on the brain. MsBRAIN researchers consider how some menopausal symptoms, such as hot flashes and sleep problems, are connected to the nervous system and how menopause can be considered a neurological as well as a physiological transition. Prior research informing the MsBRAIN study demonstrated

close links among menopausal vasomotor symptoms, cardiovascular disease, lesions on the brain known as white matter intensities, and risk factors for Alzheimer's disease and dementia.^{19,20} Early findings from the MsBRAIN study indicate that among those with a genetic predisposition for Alzheimer's disease, perimenopausal and postmenopausal women had higher amyloid plaque buildup than men and premenopausal women.²¹

Studies on Bilateral Oophorectomy at the Mayo Clinic SCORE. The SCORE program's Mayo Clinic center, directed by Dr. Mielke and [Kejal Kantarci, M.D.](#), researches the effects of early menopause brought on by bilateral oophorectomy, the surgical removal of both ovaries, usually to treat or prevent ovarian cancer or a benign condition.

Studying younger women who undergo premenopausal bilateral oophorectomy affords researchers new insights into the distinction between chronological and reproductive aging. "Premenopausal bilateral oophorectomy abruptly puts a woman into menopause and often results in typical menopausal symptoms," says Dr. Mielke. Researchers hope to learn more about reproductive aging by studying women in their early 40s, 30s, or even younger who are experiencing premature menopause as a result of this surgery.

"Historically, when a woman with cancer or another condition had her uterus removed, surgeons reasoned that she no longer required her ovaries for reproduction and removed them to prevent ovarian cancer," says Dr. Mielke. However, even after menopause, the ovaries continue to produce hormones that are important to general function and brain, cardiovascular, and bone health. "Our research shows that premenopausal bilateral oophorectomy before the age of 40 or 45 increases the risk of cardiovascular mortality, accelerated neurovascular aging, and many diseases," she says. Research from the Mayo Clinic suggests that

premenopausal bilateral oophorectomy is associated with increased risks of mortality, multimorbidity, cognitive impairment, parkinsonism, depression, anxiety symptoms, glaucoma, hyperlipidemia, cardiac arrhythmias, cardiovascular disease, arthritis, restless leg syndrome, and other diseases and conditions.²²

Currently, the Mayo SCORE is following a cohort of women who have undergone premenopausal bilateral oophorectomy to characterize additional potential adverse effects. Dr. Mielke says, "The current study involves a 3-to-4-hour clinical examination of each participant, which includes a full cognitive battery, physical function testing, and analysis of a set of age-related biomarkers. We also complete MRI neuroimaging on a subset of participants."

Dr. Mielke adds, "Some evidence from the Chicago Health and Aging Project shows that racial and ethnic differences exist among women who have had early bilateral oophorectomies. On average, among women who undergo this procedure, Black women have their ovaries removed about 10 years earlier than White women." Dr. Mielke explains that this discrepancy may result, in part, from a higher incidence of uterine fibroids among Black women. Mayo SCORE researchers hope to explore these differences further in future research.

The NIH Commitment to Better Health for Women in Midlife and Beyond

ORWH and NIH as a whole, in keeping with their missions and goals to enhance research on women's health, will continue to study and support investigations on the menopausal transition and its health effects in midlife and older women. Doing so will help to improve the health of women across the middle and later stages of their life course and to ensure that every woman receives evidence-based disease prevention and treatment tailored to her

own needs, circumstances, and goals.

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Pandemic-Era Family Caregiving Disrupts Careers of Women in Biomedicine

As popular news media have frequently reported, the COVID-19 pandemic has profoundly affected participation in the U.S. workforce. Increased caregiving responsibilities, lost jobs, and other factors have resulted in 2.5 million women and 1.8 million men leaving the U.S. job market, and Black and Latina women have been disproportionately affected.¹ Those who remain employed, including those in the biomedical workforce, have experienced increased workloads and reported negative effects on productivity, career trajectories, and well-being. Further, 36% of mothers—but only 16% of fathers—able to work from home during the pandemic report having to manage paid work along with increased family care responsibilities.²

As part of its mission to support women in biomedical careers, ORWH has tracked research on and responded to the pandemic's effects on women working in biomedicine and other science, technology, engineering, mathematics, and medicine (STEMM) fields. Health care providers, the majority of whom are women, face both increased professional workloads and greater workplace health risks because of COVID-19. Even before the pandemic, women in medicine reported having taken on more domestic work and child care responsibilities than their spouses,^{3,4} and physician burnout among women is also a problem that preceded the pandemic. Pre-pandemic data also show that having a child younger than 21 increases the odds of burnout in women physicians by 54%.⁵ Centers for Medicare & Medicaid Services (CMS) studies show that new models of care delivery as well as the burdens placed on clinicians affect physicians' work-life contentment, wellness, and productivity and, ultimately, the quality of patient care.⁶ The pandemic has exacerbated all of these problems.

In addition to more family caregiving responsibilities, biomedical investigators and physician-researchers face professional challenges such as working from home without access to laboratory facilities, increased clinical duties, and the demands of online teaching.⁷ In 2021, the National Academies of Sciences, Engineering, and Medicine (NASEM) released a report on the effects of COVID-19 on women in STEMM.⁸ Using an intersectional lens, the NASEM report shows how pandemic-associated stressors and increased workplace demands have affected women—especially women of color and other minoritized groups—in STEMM, with lasting consequences for their careers and their personal and professional lives.⁸ Results from two NIH surveys, the [NIH COVID-19 Impact on Extramural Researchers Survey](#) and the [NIH COVID-19 Impact on Extramural Institutions Survey](#),



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M.J., ORWH Physician**

show that the community of NIH-funded researchers has experienced inequities in several domains—with early-career researchers and those with family caregiving responsibilities most affected. Survey respondents reported that the pandemic has negatively affected their ability to apply for grants, access to collaborators, and ability to generate preliminary data. Several studies have shown that women, particularly women in junior STEMM positions, have submitted proportionally fewer scholarly articles to scientific journals than men.^{9,10}

The Family Caregiving Advisory Council, established by the Recognize, Assist, Include, Support, and Engage (RAISE) Act, delivered a report to the U.S. Congress in September 2021. Resulting from a 2-year, multifaceted, nationwide effort and highlighting the issues faced by family caregivers, this report makes 26 recommendations to increase understanding of the contributions of family caregivers, integrate family caregivers into the health care system and better support them, decrease the negative financial and professional effects of family caregiving, and foster research, collect data, and develop evidence-based practices to help family caregivers.

NIH—along with some universities, research institutions, and other scientific organizations—has taken steps to curb the effects of these disruptions for biomedical researchers, including providing opportunities for extending grants, fellowships, and tenure clocks; establishing supplemental funding programs; streamlining grant applications and other professional review processes; and providing other flexibilities and allowances. Many of these steps will mitigate, but not eliminate, the career disruptions of women in biomedical fields. Many commentators posit that the diminished pandemic-era productivity of women in STEMM will have a lasting impact on the diversity of the scientific workforce, which research shows is correlated with the quality and robustness of the research.

Women leaving the biomedical workforce because of burnout, increased family caregiving responsibilities, inhospitable work environments, and other reasons wastes our national investment in training highly skilled workers and decreases the diversity of the STEMM workforce, to the detriment of both the research and social equity. National and local efforts must better support family caregivers—particularly in times of crisis—to protect individual well-being, economic resilience, our investment in biomedical research, and public health.

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IN THE JOURNALS

Study Re-evaluates Risks and Benefits of Menopausal Hormone Therapy for Women Ages 50–59

(Original article by [Prentice et al. 2021. *Am. J. Epidemiol.* PMID: 33025002.](#))

From 1993 to 1998, the Women's Health Initiative (WHI) recruited approximately 44,000 healthy postmenopausal women ages 50–79, including almost 11,000 participants who had undergone hysterectomies, for a randomized clinical trial of menopausal hormone therapy. Most of the WHI enrollees were over the age of 60. Study participants received conjugated equine estrogens (CEE), CEE plus medroxyprogesterone acetate (CEE+MPA), or placebo. The CEE+MPA intervention was halted in 2002 after results suggested the regimen was associated with an increased risk of breast cancer. The CEE intervention was stopped in 2004 after findings suggested an association between CEE and risk of stroke. The results of the WHI dramatically reduced the clinical use of menopausal hormone therapy in the United States and abroad.

Long-term follow-up of study participants continued after the

completion of WHI trial interventions. WHI researchers found that hormone therapies altered other health risks. CEE+MPA was associated with a reduced risk of endometrial cancer, and CEE alone was associated with reduced risk of coronary heart disease, pulmonary embolism, colorectal cancer, endometrial cancer, hip fracture, and other health problems. Follow-up studies identified the expected increased incidence of breast cancer in the CEE+MPA group but a significant *decrease* in breast cancer in the CEE group.

These follow-up studies and previous research suggested that menopausal

hormone therapy may have different risk–benefit ratios for women in their 50s and for older women, and researchers speculated that women closer to the onset of menopause might benefit from menopausal hormone therapy without unduly increasing health risks. Thus, NIH-supported researchers [Ross L. Prentice, Ph.D.](#), and colleagues reanalyzed WHI data with different statistical methods to evaluate the health risks and benefits of menopausal hormone therapy for women ages 50–59. The investigators' analysis showed that CEE alone yields health benefits exceeding risks for women in their 50s. For this age group,



CEE alone was associated with risk reductions for breast cancer, coronary heart disease, and total mortality and with no significantly increased risks for adverse outcomes, including stroke. This analysis, however, confirmed that CEE+MPA treatment for women ages 50–59 was associated with adverse health risks.

SWAN Evaluates Physical Function Among Racial and Ethnic Groups of Midlife Women

(Original article by [Sternfeld et al. 2020](#). *J. Gerontol. B Psychol. Sci. Soc. Sci.* PMID: 31412129.)

NIH's Study of Women's Health Across the Nation (SWAN), a multisite longitudinal epidemiological study involving a multiracial and multiethnic cohort of over 3,300 women, examines the health of women during their middle years and through the menopausal transition. SWAN researchers [Barbara Sternfeld, Ph.D.](#), and colleagues evaluated how sociodemographic, psychosocial, and behavioral factors, as well as perceived stress and other factors, contribute to observed racial and ethnic differences in physical performance among midlife and older women. The evaluation showed that among study participants (women with a mean age of 61.8 years), Japanese women had the highest mean physical performance scores, followed by White, then African American, then Chinese, and then Hispanic/Latina women.

Researchers used a series of physical tasks and measures, such as a 4-minute walk and a test of grip strength, to obtain performance scores and factored mediators such as stress, comorbidity, and education into the analysis. The investigators found that the differences in performance scores between White women and women of Chinese or Japanese descent resulted from direct effects of race and ethnicity. However, at least 75% of the differences in scores between White women and African

American women as well as between White women and Hispanic women stemmed from mediating factors such as financial strain, physical activity, body mass index, and pain.

The researchers concluded that addressing pain and obesity as well as social determinants of health such as poverty, racial bias, and detrimental neighborhood environments could mitigate the racial and ethnic disparities in physical function in midlife and older women.

Researchers Identify Sex- and Species-Dependent Pain Biomechanisms

(Original article by [Tavares-Ferreira et al. 2022](#). *Sci. Transl. Med.* PMID: 35171654.)

Nociceptors are specialized sensory neurons that detect damaging stimuli and create the perception of pain. In a recent article, [Diana Tavares-Ferreira, Ph.D.](#), [Stephanie Shiers, Ph.D.](#), and their NIH-supported colleagues reported sex- and species-dependent differences in these neurons and identified potential pharmacological targets for treating pain. The researchers compared the transcriptomes (i.e., the total of all messenger RNA molecules expressed from the genes) of the cells making up the dorsal root ganglia—clusters of pain-sensitive neurons near the spinal cord—of male and female mice, humans, and nonhuman primates.

Notable among the findings were sex differences in human dorsal root ganglia neurons—namely, increased expression of the *CALCA* (calcitonin-related polypeptide alpha) gene in the neurons of female donors. The researchers also examined the expression of individual genes involved in nociceptive signaling that could be targets for analgesic drugs. These findings illuminated the sex-specific biology of acute and chronic pain, may lead to more effective medical treatments for pain, and underscored

the benefits of studying both male and female organisms and cells in accordance with the [NIH Policy on Sex as a Biological Variable](#).

Scientists Respond to Survey on NIH Policy on Sex as a Biological Variable

(Original article by [Waltz et al. 2021](#). *J. Womens Health (Larchmt.)* PMID: 33834877.)

The NIH Policy on Sex as a Biological Variable (SABV) ([NOT-OD-15-102](#)), which took effect in January 2016, articulates the expectation that NIH-supported investigators will incorporate SABV into research designs, analyses, and reporting in vertebrate animal and human studies when scientifically appropriate. In a recent article published in the *Journal of Women's Health*, [Margaret Waltz, Ph.D.](#), [Rebecca L. Walker, Ph.D.](#), and colleagues reported results from a national survey of over 1,200 scientists who use animals in their research. Survey respondents answered questions about their perceptions of the [SABV policy](#), the impact of this policy on their work, and their process of selecting animals for their research.

Almost all survey respondents answered that they had heard of the SABV policy. About 45% of respondents reported that their work already complied with SABV expectations prior to the implementation of the policy, and over one-third reported changing study designs to ensure compliance. Having received recent NIH funding was not associated with significant differences in the likelihood of researchers analyzing data by sex. Compared with men, women were more likely to publish the sex of their experimental animals. Researchers' perceptions of the SABV policy and the likelihood of their reporting the sex of animals varied widely depending on the researchers' primary model organism. The authors concluded that more effort is required to ensure more even and widespread compliance with the SABV policy.

FEATURED RESEARCH AND PERSPECTIVES

Information Scientist Studies Pandemic's Effects on Careers of Women in STEMM

(Original article by [Lerman, 12-Aug-2021, The Conversation.](#))

Many commentators have noted that the COVID-19 pandemic has resulted in career setbacks for scientists and other professionals. Women in science, technology, engineering, mathematics, and medicine (STEMM) have experienced disproportionate career effects because of increased caregiving responsibilities and other factors. Research by [Kristina Lerman, Ph.D.](#), a Research Professor of Computer Science at the University of Southern California, suggests that these setbacks may not be temporary and could compound over time because of systemic inequities in the recognition of scientific accomplishments. Dr. Lerman

indicates that gender biases affect individual researchers' decisions about whom to cite in publications. Both men and women researchers tend to cite men more frequently than they cite women, thereby increasing measures of scientific impact of research done by men. As a result, a small group of researchers—mostly men—receive a disproportionate number of prestigious positions, funds, and awards. This phenomenon, nicknamed the “Matthew effect” after the common paraphrase of Matthew 13:12 (“The rich get richer, and the poor get poorer”), was identified in the 1970s. Data show that these inequalities have increased in recent years. Dr. Lerman’s work suggests that pandemic-related career setbacks will exacerbate the Matthew effect, increase gender disparities in STEMM, and reduce the diversity and productivity of research teams.

SCIENTIST SPOTLIGHT



Siobán D. Harlow, Ph.D.

[Siobán D. Harlow, Ph.D.](#), is a Professor Emerita of Epidemiology and Global Public Health and the Director of the Center for Midlife Science in the [University of Michigan School of Public Health](#) and a Professor Emerita of Obstetrics and Gynecology in the [University of Michigan Medical School](#). Her research focuses on understanding patterns of menstrual function and gynecological morbidity

across the lifespan, including reproductive aging, the natural history of ovarian aging, and the interface between ovarian aging and chronic disease. Internationally, she has worked extensively on the impact of global trade and export production on women’s and children’s health and on the health impact of gender-based violence. Recently, her research focused on conflict-related gender-based violence in Congo, where she was a Fulbright scholar in 2017 and 2018. Dr. Harlow was the Principal Investigator of the Michigan site of the Study of Women’s Health Across the Nation ([SWAN](#)). She has served on and chaired numerous national and international research boards, health and policy advisory groups, and dissertation committees.

What is SWAN, and how are you involved?

SWAN is an ongoing study that follows a multiethnic cohort of African American, Chinese, Japanese, Hispanic, and White women. In 1996, SWAN enrolled premenopausal women ages 42–52. Over the past 25 years, these women have contributed to our scientific understanding of the natural history of menopause and its relationship to health and aging. I have

been a SWAN investigator since the study’s inception. I served as the Principal Investigator of the Michigan site from 2011 to 2021 and of the 1.7 million–biospecimen SWAN Repository from 2012 to 2018.

SWAN’s key goals have been to understand the contribution of both reproductive aging and other types of aging to women’s health and functioning in midlife and beyond as well as to understand racial and ethnic disparities in midlife health and the menopausal experience. SWAN researchers have observed changes in women’s menstrual patterns, reproductive hormones, and symptoms during the menopausal transition. We have also observed how mental and physical health and functioning change throughout midlife.

What are the barriers for women in science?

The barriers for women in science differ by generation. Senior scholars—those who championed the importance of investigating women’s health, began the seminal research, and broke through multiple glass ceilings—continue to be undervalued and are frequently passed over for leadership positions in academia, on expert panels, and on boards. Although opportunities have been opened in many arenas for junior scholars, historic barriers persist, though perhaps they are more subtle. For instance, many younger women in biomedical research have heavier academic service burdens than their male counterparts. The research field must prioritize distributing resources equitably, ensuring respect, and recognizing and publicizing scientific accomplishments, particularly as women break novel scientific ground.

What is the importance of mentorship in science?

Good mentoring produces innovative science. By encouraging my students to pursue their insightful questions, I encourage them to address critical gaps in scientific knowledge. Thus, I see my role in women's health not only in relation to my own scientific legacy but also in relation to my success in supporting the scientific growth—and, more importantly, scientific courage—of my students and junior colleagues as they tackle difficult, emergent scientific problems. I also share

with my junior colleagues some of the lessons I learned late in my career, such as how to increase one's scientific impact and how to create leadership opportunities for oneself.

Do you have advice for young women scientists?

Demand scientific rigor of yourself. Strive always for new insights. Tackle the hardest problems. Know your own worth. Never let others' disregard stifle your scientific creativity, innovation, or dreams. Celebrate your accomplishments. Speak up. Create change.

INSTITUTIONAL SPOTLIGHT

UC Davis Models Effective Practices for Equity



The University of California, Davis promotes, ensures, and sustains diversity, equity, and inclusion (DEI) through several programs,

with many initiatives focusing on DEI issues in STEM departments. Philip Kass, D.V.M., M.P.V.M., M.S., Ph.D., the Vice Provost for Academic Affairs at UC Davis, recently participated in the ORWH forum "[Effective Approaches to Fostering Faculty Gender Diversity, Equity, and Inclusion: Celebrating Progress](#)" and outlined some of his institution's DEI strategies. To mitigate unconscious bias among search committee members, UC Davis instituted a training program based on the University of Michigan's Committee on Strategies and Tactics for Recruiting to Improve Diversity and Excellence ([STRIDE](#)). UC Davis also requires statements of contribution to DEI when hiring and promoting. Other initiatives include experimental hiring programs that have increased inclusivity, climate assessments, student evaluations, salary equity analyses, and anti-harassment measures.

The UC Davis Women in Medicine and Health Sciences ([WIMHS](#)) program prioritizes the recruitment and retention of women in academic medicine, strives to improve the culture for women faculty and staff members, and provides opportunities for mentoring, leadership, and peer collaboration. WIMHS has developed a [toolkit](#) of practical guidance for women in academic medicine on a wide variety of topics, such as crafting a fundable grant and mentoring women. WIMHS Director Melissa D. Bauman, Ph.D., and colleagues presented a poster at a 2019 meeting of the [Association of American Medical Colleges](#). Their poster, "[A Novel Approach for Engaging Women from Individual Departments in Women in Medicine and Health Sciences at UC Davis](#)," describes how WIMHS departmental liaisons support the careers of women in biomedicine across academic departments.

UC Davis Health has also published "[Gendered-Impact of COVID](#)," a webpage with a list of publications documenting the impact of the pandemic on women's careers.

IN CASE YOU MISSED IT

Blog Posts for HigherEdJobs Highlight Strategies for Workplace Equity

In a recent series of blog posts for HigherEdJobs, Ann E. Austin, Ph.D., and Sandra Laursen, Ph.D.—authors of the book *Building Gender Equity in the Academy*—address the underrepresentation of women in academic STEM fields. In their [first post](#), the authors characterize the nature of the problem. In two subsequent posts, "[Creating Equity in the Workplace](#)" and "[Six More Research-Based Strategies to Advance Equity](#)," Drs. Austin and Laursen describe 12 strategies that emerged from the [ADVANCE](#) program of the National Science Foundation ([NSF](#)). These strategies involve inclusive hiring and promotion practices; efforts to improve workplace climate; opportunities for professional

development, mentoring, and networking; family-friendly policies; and other practices.

Tenure-Track Parents Face Many Obstacles to Career Success

A [recent article in *The Chronicle of Higher Education*](#) details the challenges faced by tenure-track academics who are parents, many of whom have difficulty striking a healthy work-life balance while meeting the demands of a rigorous teaching or research career. Their challenges include completing graduate studies during prime reproductive years, obtaining health insurance, managing the low pay and job insecurity of adjunct work, having a child without paid parental leave or child care subsidies, and struggling to publish and secure tenure while caring for a young child.

“Diverse Voices” Lecture Series Considers the Health of Women Through a Sex-and-Gender Lens

Since January 2021, ORWH’s “Diverse Voices: Intersectionality and the Health of Women” virtual lecture series has disseminated research findings incorporating a multidimensional focus on sex and gender. The series aims to increase public awareness, understanding, and engagement with research relevant to diverse populations of women and to highlight work by investigators receiving ORWH funding, affiliated with ORWH, or employing an intersectional or multidimensional framework.

In the first session of the series, “[Sex and Gender Disparities in the COVID-19 Pandemic](#),” [Ana Langer, M.D.](#), the Director of the Women and Health Initiative (W&HI) at the Harvard T.H. Chan School of Public Health, and [Jewel Gausman, Sc.D.](#), a Research Associate at the W&HI, led a plain-language discussion of topics explored in their [commentary article](#) published in the *Journal of Women’s Health*.

For the second talk in the series, [Lisa Bowleg, Ph.D.](#), and [Tonia Poteat, Ph.D.](#), presented “[Analysis and Action: Applications of Intersectionality in COVID-19](#).” The researchers discussed “[We’re Not All in This Together: On COVID-19, Intersectionality, and Structural Inequality](#)” and “[Navigating the Storm: How to Apply Intersectionality to Public Health in Times of Crisis](#),” commentary articles they published respectively in the *American Journal of Public Health*.

In January of this year, [Kemi Doll, M.D.](#), and [Katie O’Brien, Ph.D.](#), presented research on [cancer in women](#). Dr. Doll discussed the Patient-Centered Outcomes Research Institute’s SISTER Study, a randomized controlled trial leveraging two virtual evidence-based peer support interventions to improve outcomes for Black women with endometrial cancer. Dr. O’Brien presented on the Sister Study of the National Institute of Environmental Health Sciences (NIEHS), investigating environmental and genetic risk factors for breast cancer in a study cohort of over 50,000 women who have a sister with a breast cancer diagnosis.

In March, [Tamarra James-Todd, Ph.D.](#), and [Mahasin Mujahid, Ph.D.](#), presented “[Environmental Exposures and Disparities in Pregnancy](#).” Dr. James-Todd described an environmental justice framework and presented on the role of exposure assessment in understanding disparities in reproductive health outcomes. Dr. Mujahid presented on historical redlining, disparities in severe maternal morbidity in marginalized groups, and the University of Kansas Medical Center’s project “Enhancing Recruitment and Retention of Underrepresented Pregnant Hispanic Women in a Phase III Randomized Clinical Trial.”

The July 28 session will focus on COVID-19 in women and feature presentations from [Heather Shattuck-Heidorn, Ph.D.](#), of the University of Southern Maine and [Stephaun Wallace, Ph.D.](#), of the Fred Hutchinson Cancer Research Center. On September 29, [Natacha DeGenna, Ph.D.](#), of the University of Pittsburgh and [Sahnah Lim, Ph.D.](#), of the New York University Grossman School of Medicine will discuss violence and women.

For up-to-date information on upcoming “Diverse Voices” lectures, please visit the [ORWH Events page](#). Recordings of all the lectures are available through the [ORWH Videocasts & Webinars page](#).

Lasker Foundation “Dial an Idol” Podcast Connects Emerging Scientists with Their Role Models

The Lasker Foundation, a scientific advocacy organization that supports medical research by recognizing investigators with the prestigious Lasker Awards, recently launched “[Dial an Idol](#).” The podcast features conversations between scientists beginning their research careers and their scientific role models. Recent podcasts have featured discussions with Nobel laureate [Jennifer Doudna, Ph.D.](#), who co-designed the CRISPR gene-editing tool; MacArthur Fellowship recipient [Dianne Newman, Ph.D.](#), a microbiologist who discovered microbial mechanisms underlying geological processes; and Nobel laureate and Lasker Award winner [J. Michael Bishop, M.D.](#), who co-discovered oncogenes, genes that contribute to the conversion of healthy cells into cancer cells.

Researchers Use CRISPR Gene Editing to Produce Single-Sex Litters of Mice

In a [recent article published in *Nature Communications*](#), [Charlotte Douglas, Ph.D.](#), [Peter J.I. Ellis, Ph.D.](#), [James M.A. Turner, Ph.D.](#), and colleagues describe a method using CRISPR gene-editing technology for producing male- or female-only litters of mice with 100% efficiency. This new technique has the potential both to increase breeding efficiency and to reduce the culling of animals bred for scientific research and agriculture.



New ORWH “Pearls of Wisdom” Videos Offer Advice to Scientists and Students

ORWH’s “Pearls of Wisdom” online series of short videos aims to inspire, motivate, and inform women in the beginning or middle stages of their biomedical careers. The videos feature prominent scientists and physicians at NIH and beyond, many from underrepresented racial and ethnic groups, sharing words of wisdom, perspectives, and advice directed toward younger women scientists. ORWH regularly adds new videos to the series, which began as a collaboration with the [National Medical Association](#). You can watch the videos [here](#).

ORWH Updates NIH Maternal Morbidity and Mortality Web Portal

ORWH recently updated the [NIH Maternal Morbidity and Mortality \(MMM\) Web Portal](#), which aims to lead the discussion on MMM and to serve as a centralized hub for information related to this critical public health crisis. Recent additions describe NIH’s [IMPROVE](#) (Implementing a Maternal health and PRenancy Outcomes Vision for Everyone) initiative and link to open-access articles published in a special MMM edition of the [Journal of Women’s Health](#) by ORWH staff and colleagues. The web portal also highlights other MMM research efforts at NIH and other Federal agencies, provides key resources, and contains a collection of other trustworthy, science-based resources relevant to maternal health across the lifespan for scientists, researchers, consumers, and advocates.

STAFF UPDATES



Jasmin Bush, M.A.

Jasmin Bush, M.A., recently joined ORWH as its new Communications Director. Ms. Bush previously served as a communications professional and project manager at Georgetown University, the Substance Abuse and Mental Health Services Administration, the Food and Drug Administration, and the Office on Women’s Health within the Office of the Assistant Secretary for Health. Ms. Bush holds a master’s degree in health sciences from the University of Alabama.

Kelly Chandler, Ph.D., joined ORWH’s Science Policy, Planning, and Analysis team in April 2022 as a Health Science Policy Analyst. Prior to joining ORWH, Dr. Chandler worked in science policy at



Kelly Chandler, Ph.D.

the National Institute of Environmental Health Sciences, where she contributed to initiatives focused on women’s health, minority health and health disparities, sexual and gender minority health, and environmental justice. She earned her Ph.D. in molecular physiology and biophysics from Vanderbilt University. Her research focused on mapping ancient, evolutionarily conserved long-range enhancers of developmentally regulated genes by using comparative genomics and transgenic mouse models. Dr. Chandler completed a postdoctoral fellowship at the Environmental Protection Agency, where she was part of the Virtual Embryo and ToxCast teams building predictive models of developmental toxicity.



Benjamin Johns, Ph.D.

Benjamin Johns, Ph.D., joined ORWH as a Social and Behavioral Sciences Administrator in February 2022. He received his Ph.D. in public health from Johns Hopkins University, where he studied health economics and wrote a thesis on equity-efficiency trade-offs. He has also earned master’s degrees in public administration and American culture studies. Prior to joining NIH, Dr. Johns worked as a Senior Associate/Health Economist for Abt Associates in international development, where he worked with the U.S. Agency for International Development, the U.S. Department of Agriculture, the U.K. Department for International Development, the Bill & Melinda Gates Foundation, and other private foundations. He has also worked as a Technical Officer for the World Health Organization.

STAFF UPDATES

New Publications from ORWH Staff

ORWH Director **Janine A. Clayton, M.D., FARVO**, NIH Chief Officer for Scientific Workforce Diversity **Marie A. Bernard, M.D.**, and colleagues recently published "[Community Voices: NIH Working Toward Inclusive Excellence by Promoting and Supporting Women in Science](#)" in *Nature Communications*. This commentary explores NIH's anti-harassment efforts, the NIH Equity Committee, the Women Scientists Advisors, the Working Group on Women in Biomedical Careers, NIH hiring practices, numerous NIH-supported research efforts, and other work to improve inclusivity within the biomedical research field.

Dr. Clayton, ORWH Health Science Strategy and Relations Lead **Jamie White, M.S.**, and colleagues published "[The Integration of Sex and Gender](#)

[Considerations into Biomedical Research: Lessons from International Funding Agencies](#)" in *The Journal of Clinical Endocrinology & Metabolism*. The article outlines policies and other mechanisms of government and other funding agencies related to sex as a biological variable ([SABV](#)) and gender as a sociocultural determinant of health. Dr. Clayton, Ms. White, and colleagues describe the incentives and requirements developed to encourage biomedical researchers to consider sex and gender influences on health, and they share lessons learned to date.

ORWH Associate Director for Science Policy, Planning, and Analysis **Samia Noursi, Ph.D.**, Dr. Clayton, ORWH Statistician/Health Science Policy Analyst **Ching-yi Shieh, Ph.D.**, and colleagues co-authored "[Developing the Process and Tracking the Implementation and Evaluation of the National Institutes of](#)

[Health Strategic Plan for Women's Health Research](#)" for *Global Advances in Health and Medicine*. The article describes the development of tools and approaches that NIH Institutes, Centers, and Offices could utilize to implement and evaluate [Advancing Science for the Health of Women: The Trans-NIH Strategic Plan for Women's Health Research, 2019–2023](#).

ORWH Associate Director for Clinical Research **Sarah M. Temkin, M.D.**, and colleagues published "[Creating Work Environments Where People of All Genders in Gynecologic Oncology Can Thrive: An SGO Evidence-Based Review](#)" in *Gynecologic Oncology*. The review article shares results from the Society of Gynecologic Oncology's 2020 State of the Society Survey and makes recommendations to enhance gender equity within gynecologic oncology and thereby improve patient care.

UPCOMING EVENTS

Diverse Voices Virtual Talk: COVID-19 and Women

July 28, 2022
2:00 – 3:00 p.m. EDT

Diverse Voices Virtual Talk: Violence and Women

September 29, 2022
2:00 – 3:00 p.m. EDT

57th Meeting of the NIH Advisory Committee on Research on Women's Health

October 18, 2022
9:30 a.m. – 4:30 p.m. EDT

Gender and Health: Impacts of Structural Sexism, Gender Norms, Relational Power Dynamics, and Gender Inequalities

October 26, 2022
11:00 a.m. – 5:00 p.m. EDT

Building Interdisciplinary Research Careers in Women's Health (BIRCWH) Annual Meeting

November 2, 2022
8:00 a.m. – 5:00 p.m. EDT

For up-to-date information, visit www.nih.gov/women.

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