

INNOVATIONS

► in Women's Health

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A QUARTERLY PUBLICATION of Women's Health Research at Yale



Playing with a Purpose

Video Game Empowers Black Teens to Prioritize their Health

Damien is knowledgeable about sexually transmitted infections (STIs), open to serious conversations about sex, has questionable taste in music, and won't stop talking about his ex.

Is this someone you might want to date?

This is the type of question aimed at the players of InvestiDate, a video game designed through peer-reviewed studies and the recommendations of Black female adolescents who have provided guidance to the researchers. It is just one question within the video game designed to help navigate the challenges of dating and, if sexually active, while remaining protected against STIs, including HIV/AIDS.

All adolescents face these kinds of challenges and have similar behaviors across demographic groups. Yet, Black female American adolescents are at increased risk for infection due to greater rates of limited access to health care, reduced awareness of infection status, and reluctance to seek help due to a higher sense of stigma and fear of discrimination, according to the U.S. Centers for Disease Control and Infection.

Research has demonstrated that games can deliver valuable health information and influence health behaviors.

"Our game is about helping teens ages 14-18 become empowered to overcome the unique obstacles they face as young, female people of color

[Continued on page 3...](#)

(Left to right) Ijeoma Opara, PhD, and Kimberly Hieftje, PhD, the principal investigators for InvestiDate, a video game originating from a WHRY-funded pilot project. Illustration by Leslie Glanville.

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Women's Health Research at Yale was founded in 1998 with initial funding from The Patrick and Catherine Weldon Donaghue Medical Research Foundation. Women's Health Research at Yale is a program within Yale School of Medicine. Yale University is a 501(c)(3) nonprofit organization.

Playing with a Purpose (Continued from front cover)

in the highly technological world of modern dating,” said Dr. Kimberly Hieftje, leader of the project, assistant professor of pediatrics, and director of the play4REAL XR Lab at Yale. “When adolescents are starting to think about becoming sexually active or they want to get tested for STIs with a partner, we can help them navigate that.”

Begun as a role-playing card game through a Women's Health Research at Yale grant awarded to Dr. Hieftje and Dr. Lynn Fiellin, director of the Yale Center for Health & Learning Games, InvestiDate earned additional funding from the National Institutes of Health (NIH) to evolve into a prototype web-based collaborative multiplayer game developed by PreviewLabs. Now, Dr. Hieftje and her colleagues are conducting a randomized controlled trial to evaluate the game's capacity for helping make good choices about health when dating.

“In designing this game, it was vital to involve voices with lived experience,” Hieftje said, emphasizing the contributions of Dr. Ijeoma Opara, assistant professor at the Yale School of Public Health and founder and director of the school's Substance Abuse and Sexual Health Lab, and the game's graphic artist, Leslie Glanville.

The game's design follows the original WHRY-funded template, introducing an assortment of male adolescent characters represented with an illustrated headshot and brief social media profile. As the game progresses and storylines form, the players can learn positive personality traits and bits of information that could represent “green flags” for the players – evidence that the possible “date” might be someone worth getting to know better. Negative details represent “red flags” that might characterize an individual as someone not worth

pursuing. The players discuss the details – either in the same room or in an online chat – and vote on how safe or risky, cool or uncool, they consider each trait.

Players select goals worth various points, such as starting to date someone (50 points), “unfollowing” a character with two or more risky traits (80 points), getting tested by a doctor for HIV (120 points), or changing a partner's mind about condom use (150 points). The first player to 300 points wins the game.

As the players gather information about each character, they can decide if they want to date them or pass on them to pursue other opportunities. The game includes a pair of older peers and a doctor to provide helpful information on topics such as STIs and how to engage in safer sex practices. Players can also challenge each other to trivia contests on health topics and even compete to see who has the “best” boyfriend.

“It's a social game,” Hieftje said. “We provide important information on STIs but present it within the larger context of healthy dating and what relationships are like today.”

The researchers, including Dr. Opara, Dr. Veronica Weser, Brandon Sands, and Dr. Claudia-Santi Fernandes, conducted focus groups with heterosexual Black female adolescents to better understand how they and their peers evaluate and choose potential romantic partners online. Future iterations of the game might involve different sexual orientations and genders, but this one focuses on heterosexuality because of the high risk of STI transmission for females. The sessions helped the researchers design gameplay that matched the lived reality of the participants, including how teenagers use different social media

platforms for different purposes and how they can experience racism and bias over social media.

Hieftje also stressed the importance of WHRY's early investment, particularly for junior faculty just beginning to build a research program.

“That initial pilot project generated the data I needed to receive my first NIH grant,” Hieftje said. “That type of funding is essential for newer investigators, who don't necessarily have a lot of opportunities to launch our own projects. This has been a really wonderful experience.”

Hieftje is partnering with schools to test the game, making sure participants have the support they need. The researchers are playing the game with 40 participants, while another group of 40 will serve as a control group playing a different game that does not provide the same educational content. When completed, the researchers will follow up to compare the groups and see if InvestiDate players retain knowledge and change behaviors about saying no and practicing safer sex, among other outcomes. The game provides specific resources to access free health services in players' communities, including STI testing.

After demonstrating the game's effectiveness in promoting safer behavior through more informed, empowered decision making, Hieftje hopes to offer the game to schools and community programs.

“We need to talk to young people early,” Hieftje said. “So when the time comes, they can be prepared with the knowledge and strength to choose what's best for themselves.” ◀



COVID-19 and PTSD

Assessing the Pandemic's Toll on Mental Health

Illness, grief, job loss, social isolation, uncertainty, and other pandemic-driven stressors have contributed to an increase in psychological distress on an unusually wide scale. As researchers and clinicians continue to grapple with the psychological fallout from COVID-19, a growing body of literature has examined the prevalence of post-traumatic stress disorder (PTSD) in the general public.

Women's Health Research at Yale, in partnership with colleagues at the University of Bordeaux in France and the U.S. Department of Veterans Affairs National Center for PTSD, published a paper in the journal *Chronic Stress* identifying 36 studies assessing PTSD symptoms in the general population, and the occurrence of these symptoms ranged from 5 percent to 55 percent of those being studied, averaging 26 percent across the studies.

How can these estimates vary so greatly, and can such wide swaths of the public truly be suffering from pandemic-related PTSD? Before the pandemic, about 3.5 percent of American adults every year were diagnosed with PTSD, with women twice as likely as men to have the disorder.



Dr. Mathilde Husky, previously a postdoctoral student with Dr. Mazure and now a professor at the University of Bordeaux, is lead author of a study on classifying the pandemic's effect on mental health.

The American Psychiatric Association defines PTSD as a disorder in which someone experiences “intense, disturbing thoughts and feelings” for long periods following a traumatic event. Such a diagnosis requires, in part, that the event involve “actual or threatened death, serious injury, or sexual violence” either directly; as a witness; or learning of a loved one’s serious injury, encounter with sexual violence, or violent or accidental death.

“Can the public truly be suffering from PTSD?”

Dr. Mathilde Husky, professor of clinical psychology at the University of Bordeaux and lead author of the paper, notes that a life-threatening medical condition does not qualify unless it involves sudden or catastrophic events, such as waking up during surgery or anaphylactic shock. Husky and her co-authors question whether the pandemic “as a disruptive global experience can be construed as direct exposure to a traumatic event in the general population.”

“As clinicians, when we ask about symptoms of PTSD, it’s always in reference to a specific traumatic event, with a significant level of shock,” Husky said. “In the context of a pandemic that is nearing two years in length, if I ask someone if they are experiencing flashbacks, the question becomes: flashbacks of what? Are they avoiding cues in their environment or situations that would expose them to things that would remind them of the

event? Some people report a singular traumatic event in the context of the pandemic, but many do not.”

These findings have led the authors to question whether the pandemic can be considered as a single entity when it can affect people in so many different ways over such a long period of time, depending on their jobs, exposure to the disease, preexisting stressors and psychopathology, and many other factors. And, as importantly, whether other existing classifications adequately address the health needs of individuals who experience stress not as a single event but as an enduring experience with varying levels of severity or shock.

The authors, including Drs. Robert Pietrzak of Yale and the National Center for PTSD and Brian Marx at the National Center for PTSD, suggest that the next research step should be to ensure that PTSD criteria are met when evaluating PTSD or consider another, alternative way of classifying perceived stress that is related to a long, ongoing adverse experience. In addition, the authors suggest researchers should gather data on preexisting mental health disorders and prior exposure to traumatic events to better determine the source of more recent symptoms.

“We must also continue to focus on how preexisting and concurrent stressors may disproportionately affect women more than men,” said Dr. Carolyn M. Mazure, senior author on the paper and director of WHRY. “There is a growing body of evidence showing that lockdowns, school closures, and working from home to reduce the spread of COVID-19, for example, have had a greater effect on women. Is this because women have greater ongoing stressors?” ◀

Stress on the Front Lines and in the Background

Comparing Resilience in Female and Male Health Care Providers

After experiencing a major stressor, women are more likely than men to report signs of anxiety or other symptoms of distress. This has led some to conclude that women may be less psychologically resilient than men. However, as shown by Women's Health Research at Yale investigators studying stress in health care providers on the front lines of COVID-19, gender differences in reported distress were not found when the presence of preexisting or concurrent stressors were taken into account.

In a paper in press in *The Journal of Clinical Psychiatry*, lead researchers Dr. Sarah Lowe and Dr. Robert Pietrzak found that women’s disproportionate employment in lower-status medical roles, higher levels of preexisting burnout, and greater pandemic-related work-life conflicts entirely accounted for higher levels of reported psychological distress — symptoms of depression, anxiety, and post-traumatic stress.

“In examining reactions to major stressful experiences like the pandemic, it’s important to know what actually contributes to distress — is it the major ‘index’ stress being studied or a combination of the index stress on top of ongoing stress?” Lowe said. “What we found was that women in general have greater ongoing life stress than men because of disparities in social position and psychosocial responsibilities, such as caretaking for loved ones. And this is what accounted for greater reports of distress for women than men.”

In partnership with Mount Sinai Hospital in New York City, the researchers surveyed more than 2,500 health care providers at the hospital during the first wave of COVID-19 infections in 2020. Although women were more likely than men to report symptoms of psychological distress



Mount Sinai Hospital is integrating lessons from a WHRY-funded study of frontline health care providers into a program designed to address the psychosocial effects of the pandemic and help build resilience and personal growth.

(42 percent vs. 30 percent), this difference was no longer significant after taking into account preexisting and concurrent stressors, which are more often experienced by women.

“Using a framework that accounts for a wide range of sociodemographic, health, lived experience, and psychosocial factors, we can more accurately understand how an individual responds to new sources of stress and trauma, as well as how these responses may differ in women and men,” Pietrzak said. “This information can help us better design and deploy personalized interventions to prevent and alleviate adverse mental health outcomes.”

Additional authors on the study include WHRY Director Carolyn M. Mazure, PhD, Rachel Hennein of Yale, and Drs. Jordyn Feingold, Lauren Peccoraro, and Jonathan Ripp of Icahn School of Medicine at Mount Sinai.

Mount Sinai has already integrated lessons from their ongoing study of frontline health care providers

into its Center for Stress, Resilience, and Personal Growth — a multi-disciplinary program designed to address the psychosocial effects of the pandemic and build resilience and personal growth in this population.

“Usually, translation of research findings into practical applications can take years or even decades,” Pietrzak said. “This center was established in a matter of weeks and was directly informed by our team’s findings.”

The researchers are continuing to analyze data from the health care workers to study long-term mental health outcomes. They hope that this research will benefit women under stress by identifying preexisting and event-specific stressors that may influence psychological distress and resilience.

“If you are a woman who is struggling with symptoms related to the pandemic, it might help to know that a lot of it could be due to the additional burdens often placed on women,” Lowe said. “You are not alone.” ◀

What West Point Graduates Can Teach Us About Stress and Resilience



Dr. Melissa Thomas, a graduate of the U.S. Military Academy at West Point and Yale School of Medicine, is now an emergency medicine resident at Yale New Haven Hospital.

In May 2020, during the first wave of the COVID-19 pandemic, Dr. Melissa Thomas graduated Yale School of Medicine and immediately started work in the Emergency Department of Yale New Haven Hospital. She quickly noticed similarities between her new job and her two deployments to Iraq as a U.S. Army Medical Service Corps officer.

“Relying on teamwork, having strong bonds with people going through these experiences with you at the same time — that’s very similar,” Thomas said. “It’s why I was drawn to emergency medicine.”

But high stress can also have negative consequences for mental health, even among highly trained and experienced health care providers. To explore how to promote psychological resilience and prevent negative health outcomes among such individuals, Dr. Thomas investigated the long-term physical

and mental health risks and resilience of her fellow graduates from the U.S. Military Academy at West Point. It was the first study to focus on graduates and consider gender differences in these topic areas since the elite institution’s integration of women in 1980. It earned Dr. Thomas the William U. Gardner Prize for the most outstanding thesis in her graduating class.

Now published in the peer-reviewed journal *Chronic Stress*, the study surveyed 1,342 graduates from the classes of 1980-2011 to collect sociodemographic information and data on self-reported physical and mental health behaviors and conditions as well as details of their military service. Women’s Health Research at Yale Director Carolyn M. Mazure, PhD, and Dr. Robert Pietrzak, director of the Translational Psychiatric Epidemiology Laboratory in the Clinical Neurosciences Division of the

U.S. Department of Veterans Affairs National Center for Post-traumatic Stress Disorder, served as Dr. Thomas’ mentors on her medical school thesis and published the *Chronic Stress* paper with her. Other authors include Dr. Steven Southwick at Yale, Dr. Dana Nguyen of the Uniformed Services University, and Dr. Diane Ryan of Tufts University.

After applying statistical models developed by Dr. Pietrzak, Dr. Thomas found that increased psychological resilience in the graduates was associated with a higher sense of purpose in life, social connectedness, and grit, which is defined as “perseverance and passion for pursuing long-term goals.”

“A lot of research on stress and trauma focuses on negative outcomes,” Thomas said. “But by focusing on successful resilience we can learn a lot about how to build prevention strategies.”

Notably, greater time in military service correlated with higher resilience for women but had little correlation for men. The authors suggest this apparent difference in resilience for women remaining in the service might be due to the relative reduction in resilience for those goal-oriented women trained at West Point who leave the service. This latter group may leave paid work in the process of raising a family or pursue a non-military career, and in so doing feel a reduction in their purpose in life or find difficulty adapting to male-dominated fields without the structure and stability of military formalities.

“There are many ways that people can build their mental health and prevent negative health outcomes,” Thomas said. “With this new research, we can see the importance of enhancing purpose in life, social connectedness, and even grit to improve the capacity for resilience in the face of stress or trauma.” ◀

Planned Giving

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Women’s Health Research at Yale relies on contributions to support our pioneering research benefiting women’s health and examining the influence of sex and gender on health. Through planned giving, WHRY can help interested donors make larger gifts than they thought possible, including options that can provide income to donors that can keep pace with inflation, avoid capital gains taxes, and reduce estate tax liability.

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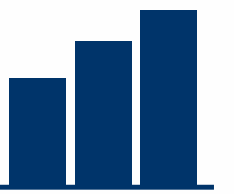
Questions?

We can help you determine the best options for you to plan for your future, the future of your loved ones, and the future of WHRY. For more information, please contact Shayna Roosevelt at 203-764-6600 or at Shayna.Roosevelt@yale.edu. ◀

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Women’s Health Research at Yale

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Today's Students — Tomorrow's Researchers, Clinicians, and Teachers



(Left to right) WHRY undergraduate fellows Gillian Clouser, Michelle Osagie, and Margaret Hankins work to advance the center's mission while learning about the importance of studying the health of women and the influence of sex and gender on health.

Changing medical research and practice to better serve everyone takes time, effort, and partners. Women's Health Research at Yale's many collaborators understand the importance of studying the health of women and the influence of sex and gender on health.

To make sure this effort succeeds and endures, WHRY prepares our future collaborators, mentoring graduate students and rising junior faculty members. Starting six years ago, the center began mentoring undergraduate students as well, offering hands-on training with faculty members across disciplines to learn the latest approaches to the science of women's health.

Today, our former students are in medical schools and PhD programs. They embrace the knowledge they gained with WHRY and apply it to their current work, putting lessons into practice and influencing their peers.

This year, we are proud to introduce three new students from our Undergraduate Fellowship.

Gillian Clouser

Class: 2023

Majors: Molecular, cellular, and developmental biology; anthropology

WHRY Mentors: Dr. Carolyn M. Mazure, the Norma Weinberg Spungen and Joan Lebson Bildner Professor in Women's Health Research and professor of psychiatry and psychology at Yale School of Medicine; director, Women's Health Research at Yale; and Rick Harrison, communications officer at WHRY

Fellowship: Gillian is partnering with WHRY fellow Margaret Hankins to enhance WHRY's student-led blog, "Why Didn't I Know This?" Drawing from personal experience, research, observation, and contemporary news events, Gillian offers regular insights into subjects affecting the health of women, illustrated through prose and images of her own design.

Interests: Gillian hopes to become an obstetrician-gynecologist specializing in fertility. She works as a peer tutor for the introductory

biology course series through Yale's Poorvu Center for Teaching and Learning, where she has weekly office hours for students to discuss content, reviews homework questions, and holds preparation sessions for quizzes and exams. She also works for a public health foundation back home in California and as an assistant researching male infertility and contraception in Dr. Jean-Ju Chung's cellular and molecular physiology lab.

From Her Blog: "Research from the last two decades has revealed that women are as much as 33 percent more likely to visit their primary care providers or other physicians, even when excluding visits related to pregnancy and obstetrical care. But this tendency may not translate well to virtual appointments. In a large study published last year, the authors reported that women are less likely to use video when utilizing telehealth services, opting instead to use phone services."

Margaret Hankins

Class: 2024

Major: Molecular biophysics and biochemistry

WHRY Mentors: Dr. Carolyn M. Mazure and Rick Harrison

Fellowship: As an author of our blog, "Why Didn't I Know This?," Margaret is also providing her unique perspective on issues facing the health of women. Margaret brings readers along on her journey of discovery, as she examines timely topics of import with a particular emphasis on how intersecting aspects of identity influence health and disease. She is also creating illustrations in her own style to attract new readers and explain complex subjects.

Interests: A resident of Washington, D.C., Margaret has volunteered at the National Museum of Natural History, engaging with visitors as they learn about concepts such as climate change and evolution. She has won awards in citywide science competitions, organized events for her city's public library, and led focus groups to learn about teen cellphone use.

From Her Blog: "One in three adults in the United States has low health literacy, meaning difficulty obtaining, processing, and understanding

information needed to make health decisions and access health services. This problem disproportionately affects marginalized groups, such as people with less formal education, people with fewer economic resources, and non-native English speakers. As patients, such individuals are less likely to ask questions about health services, less likely to request additional services, and less likely to seek new information. They receive fewer screenings for diseases, have higher hospitalization rates, and have a higher mortality rate. Importantly, a patient's gender can present an additional barrier in a doctor-patient relationship, with significant implications for health outcomes."

Michelle Osagie

Class: 2022

Major: Molecular, cellular, and developmental biology

WHRY Mentors: Dr. Kelsey Martin, assistant professor of clinical medicine (hematology)

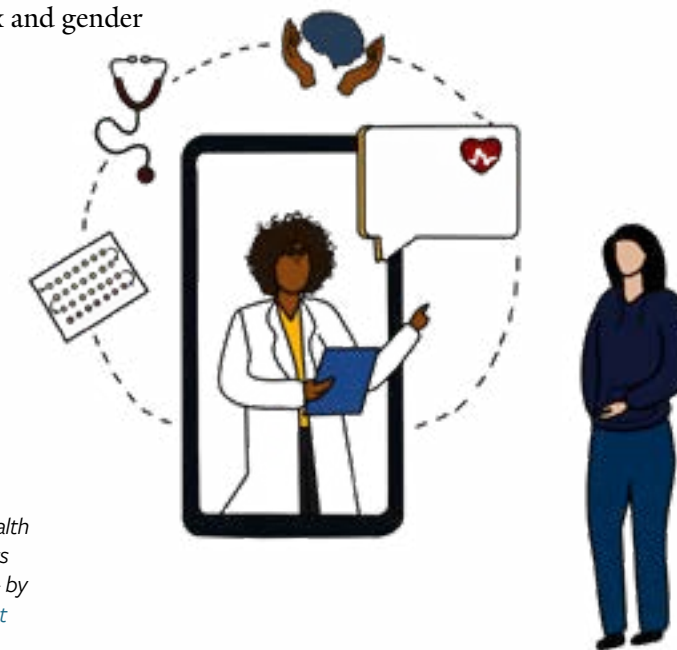
Fellowship: Michelle is working with Dr. Martin to ensure that future health care providers and researchers are equipped with contemporary data on the health of women and on how sex and gender

influence health and well-being. Her efforts include identifying pertinent research papers on sex and gender from which new content can be drawn and incorporated into Yale School of Medicine courses. Importantly, Michelle will be working with Dr. Martin to partner with course directors and lecturers to incorporate these data into lectures within the curriculum. This ongoing work will create a model for other institutions as well, so that students are taught essential findings and can then apply these lessons to better care for their patients.

Interests: Michelle is a research assistant studying cyanide detoxification in the laboratory of Dr. Ronald Breaker, Sterling Professor of Molecular, Cellular, and Developmental Biology and professor of molecular, biophysics and biochemistry. She has pioneered university-wide programs to increase access to hospital services, led student orientation for a New Haven community services organization, and promotes equality in health care professions through the Afro-American Cultural Center. ◀



Illustration by Gillian Clouser for her blog post, "Telehealth Today and Its Promise for Tomorrow." Read more posts from our student blog — "Why Didn't I Know This?" — by visiting <https://medicine.yale.edu/whr/training/blog/wdikt> or scanning the QR code.



COVID-19 and Seizing the Moment By Rick Harrison

Every crisis presents an opportunity to learn, improve our methods, and avoid the next crisis. In health research and care, the benefits can include millions of lives.

In the United States, COVID-19 has killed one in 500 people, a heartbreaking toll that in September overtook a U.S. Centers for Disease Control and Prevention estimate of Americans who died during the 1918 flu pandemic.

What have we learned?

For starters, we have learned how to develop, test, and deploy safe and effective vaccines that can target the specific structures of a coronavirus. We have learned how to reduce transmission through proven techniques such as physical distancing and wearing masks. We have also learned strategies — and their limitations — for how to best achieve cooperation with such measures and health policies for the public good.

At Women's Health Research at Yale, we moved quickly in response to COVID-19, launching a study with Dr. Akiko Iwasaki identifying sex differences in how the immune system reacts to the virus, helping to explain the mechanisms by which men are more likely to die from the disease. Another WHRY study addresses the ways in which frontline health care workers might better equip themselves

to cope with the many stressors they face in treating COVID-19 patients. And, this time, our unique study is taking into account the preexisting stressors often linked to racial, ethnic, and gender identities.

The pandemic is not over, and we still have much to learn about “long COVID-19” symptoms and how various populations react to the disease differently. But even as we continue to grapple with the many questions raised by this virus, the pandemic represents an even broader opportunity to change science so that we better address the health needs of everyone.

COVID-19 is itself an opportunistic disease, attacking people who are already vulnerable because of their existing health conditions, such as obesity, immune deficiency, cancer, and heart disease. It has ravaged overburdened and under-resourced communities, disproportionately comprised of people of color. Pregnant and lactating people did not immediately have the answers they required about the specific dangers of COVID-19 and the safety of vaccines. This shows us that we need to learn more about the underlying conditions that leave too many vulnerable to sickness and study our differences so that we can target individual prevention and treatment strategies to individual needs.



That's why WHRY exists. Our center fills wide knowledge gaps concerning the health of women and differences between and among women and men. We work with Yale's health policy lab Elevate to overcome disparities that disproportionately sicken and strain lower-income individuals. We forge collaborations and share knowledge with health professionals and the communities we serve so that people have the best available answers before making vital health decisions.

The pandemic has once again exposed the challenges we face to improve health research and practice to achieve a better life for all. Now we just need to take advantage of this pivotal opportunity. ◀

We Need to Take Care of Each Other

The COVID-19 pandemic has affected everyone, but not everyone equally.

We know that men are more likely to suffer severe cases and die from the disease. We know that Black and Hispanic Americans have been more than twice as likely to die from COVID-19 as White Americans. We know that women are more likely to suffer from “long COVID-19” symptoms. We know that women have been less likely to recover jobs lost early in the pandemic.

And now we are learning about the pandemic's toll on our country's mental health.

In June 2020, as the pandemic's first wave continued to spread across the country, 40 percent of adults reported struggling with mental health or substance misuse related to the pandemic, according to the U.S. Centers for Disease Control and Prevention (CDC). Reports from the CDC on the prevalence of anxiety disorders and depressive symptoms were both four times greater than similar data collected the previous year. In October of this year, the American Academy of Pediatrics, the American Academy of Child and Adolescent Psychiatry, and the Children's Hospital Association declared a national mental health emergency for children and teens because of the pandemic.

Women have been more likely to report symptoms of anxiety and depression than men during the pandemic. This is in line with data before COVID-19 and consistent with findings that, for example, women are more likely to have reduced economic resources while also more likely to have roles as caregivers. As a consequence, women report higher rates of burnout associated with these sources of mental distress. As with impacts on already marginalized groups, the pandemic has exacerbated existing problems and disparities.

Women's Health Research at Yale Director Carolyn M. Mazure, PhD, pioneered research on gender differences in depression, showing how stress is a more potent pathway for depression in women than in men and using these findings to develop more effective interventions.

Now WHRY is leading the way with investigations into how the specific stressors and coping strategies affect the mental health of health care workers on the front lines of COVID-19, the majority of whom are women, and how we can use these data to formulate strategies to promote resilience. We are also learning from the mental health outcomes of West Point graduates and investigating the mental health costs of the pandemic on the general population.



COVID-19 has touched all aspects of our lives. Thanks to your support, WHRY works to ensure that we understand the health — physical and mental — of women and the differences between and among women and men. Because, even as our differences matter, we all deserve the same opportunity for health and happiness. ◀

With great appreciation for your support,

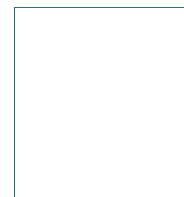
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Women's Health Research at Yale

► Better science, better lives ► ►



Women's Health Research at Yale is changing the landscape of medical research and practice by ensuring the study of women and examining health differences between and among women and men to improve the lives of everyone.

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