

# DISCOVERIES

MAGAZINE

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REACHING NEW HEIGHTS

UC San Diego  
HEALTH SCIENCES

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UC San Diego Health Sciences comprises the region's only academic health system, one of the nation's top research-intensive schools of medicine, the Herbert Wertheim School of Public Health and Human Longevity Science and the Skaggs School of Pharmacy and Pharmaceutical Sciences.

Over the last year, I have had the pleasure of immersing myself in the world of UC San Diego Health Sciences. As its new vice chancellor, it has been my privilege to engage with this community and witness its unwavering commitment to excellence in research, education and clinical care. Across all of my interactions and experiences, one thing has become clear:

**UC San Diego Health Sciences is truly reaching new heights.**

IN 2023, WE CELEBRATED THE TOPPING OUT OF our new outpatient pavilion, the first phase in a transformative redevelopment of the Hillcrest Medical Campus. We broke our own records in fundraising, bringing in larger-than-ever gifts to support our research and clinical programs. We enrolled the most diverse class of medical students in our school's history. We even sent our research to space.

You can't get much higher than that, but we're not stopping now.

UC San Diego is a home for changemakers: those who break boundaries, explore uncharted territories and redefine what is possible in the realm of health sciences. There's an electricity here. A sense of possibility. A penchant for evolution and growth. We're on the rise, and we know the best is yet to come.



This issue of *Discoveries* celebrates that upward momentum. As you delve into the stories within this magazine, you will witness the incredible work and dedication of our faculty, staff and students. You'll also hear from three university leaders as they describe recent initiatives in our research, clinical and academic spaces. Together, we are writing the next chapter of our legacy.

In highlighting a selection of our recent achievements, we also demonstrate several aspects of our mission and values.

We aim to be a beacon of inclusivity, ensuring that our local communities receive the care and support they deserve. We believe that a multicultural, anti-racist and socially conscious approach to health care leads to excellence.

We continually set a high bar in education and training. By expanding and evolving our academic programming, we are raising the profile of our three professional schools: UC San Diego School of Medicine, Herbert Wertheim School of Public Health and Human Longevity Science and Skaggs School of Pharmacy and Pharmaceutical Sciences.

We support our researchers and clinicians as they pursue new ideas, new tools and new collaborations. Our growing list of centers and institutes showcases our breadth of scientific expertise and our commitment to advancing patient care at UC San Diego Health.

This year's *Discoveries* is more than a publication; it is a testament to our collective resolve to scale new peaks, reach new horizons and make a profound impact on the future of health care. Together, we are pioneers of possibility, and I am honored to share this remarkable journey with you.

Sincerely,

**JOHN M. CARETHERS, MD**  
Vice Chancellor for Health Sciences  
University of California San Diego

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# RECORD-BREAKING GENEROSITY

Support from donors boosts UC San Diego Health Sciences to new heights.

BY JADE GRIFFIN

WHEN THE WORLD'S TOP PHYSICIANS AND researchers come together with visionary philanthropists and donors, the potential for medical breakthroughs and discoveries is vast. During the 2022–2023 fiscal year, our supporters were more generous than ever, donating a total of \$565.7 million to UC San Diego, with an impressive \$320.1 million of that directed to Health Sciences.

Part of UC San Diego's historic milestone fundraising year included the largest gift in the campus's history — a \$150 million gift from **T. Denny Sanford** to establish the UC San Diego Sanford Stem

Cell Institute, which is taking stem cell research to new frontiers, including space (see "UC San Diego scientists are sending cells into space and health science into the future" on page 12).

Each year, many donors seek to fuel medical research to fight conditions and diseases that have touched their own lives, as well as affecting millions of others. Here is a sampling of some of the gifts and initiatives announced in 2023 that will elevate Health Sciences research and education to even greater heights.

## HEALTH SCIENCES FUNDRAISING BY THE NUMBERS

**\$565.7M**

Total donations to UC San Diego in 2022–2023 fiscal year

**\$320.1M**

Total directed to UC San Diego Health Sciences

**\$150M**

Largest gift in UC San Diego history from **T. Denny Sanford**

### Gene Therapy Initiative Launched

With a \$5 million gift from their family foundation, **Nancy and Jeff Stack** established the Gene Therapy Initiative at UC San Diego with the goal of providing hope for pediatric and adult patients who could potentially benefit from gene therapy research and treatments.

When the Stacks' daughter Natalie was less than a year old, she was diagnosed with cystinosis, a rare genetic disease that was considered terminal at the time. Today, Natalie is 32 and planning her fall wedding thanks to groundbreaking treatments, including stem cell gene therapy.

Reflecting on their daughter's transformative experience, Nancy and Jeff Stack established the UC San Diego Gene Therapy Initiative, led by **Stephanie Cherqui, PhD**, professor of pediatrics and chair of the Cystinosis Stem Cell and Gene Therapy Consortium, and **Alysson Muotri, PhD**, professor of pediatrics and cellular and molecular medicine.

"Our hope is that this opens the door to more effective therapies for those dealing with rare disorders and diseases," said Nancy. "We believe that the new Gene Therapy Initiative will give others hope, just as we received hope for our daughter through new and better treatments."

### Lifting Up Lupus Research

To advance research and patient care for those suffering from lupus, **William J. Wolfe and his family** donated \$1.6 million to establish the Wolfe Lupus Research Fund. In recognition of the gift, **Kenneth Kalunian, MD**, who leads the UC San Diego Lupus Center, will hold the title of Wolfe Family Director.

Wolfe and his family are no strangers to the effects of lupus. His daughter, Jacqueline, has suffered from a particularly challenging case of the condition.

"My daughter has tried over 50 different medications. She has spent weeks in the intensive care unit," said Wolfe. "She is stable now, and it is in large part because Dr. Kalunian refused to give up. My hope is that this will provide support so that UC San Diego can offer that same excellent care to more lupus patients from around the country."

In addition to providing discretionary funds to support lupus research, Wolfe's gift will offer funding for a clinical patient services manager and facilitate the recruitment of an early-career faculty clinician focused on lupus.

### Circadian Biology Gets a Boost

Like clockwork, our natural biological systems come under public scrutiny twice a year when we adjust into and out of daylight saving time. Many questions remain regarding how our circadian systems align with our health, especially during times of illness.

**Irwin and Joan Jacobs** have established an endowed chair and research fund that aims to study largely unexplored areas related to circadian biology and human

health. The Stuart and Barbara L. Brody Endowed Chair in Circadian Biology and Medicine honors **Stuart Brody, PhD**, a renowned UC San Diego leader in circadian biology, and his wife **Barbara Brody, MPH**, a prominent researcher and teacher in public health and community medicine.

The Brody Chair and supporting fund aim to fill a critical gap at the intersection of research, circadian biology and patient care.

"Our colleagues in charge of hospital care are excited about this initiative because they would like to see how it improves the patient experience," said Stuart Brody.

### Up to the Challenge

In a time where there is a shortage of health care providers, UC San Diego is prepared to train the next generation of health care leaders, yet financial need is a barrier for many of our admitted students.

To address this great need, Vice Chancellor for Health Sciences **John M. Carethers** announced the launch of the UC San Diego Health Sciences Scholarship Challenge in September, with a commitment of \$12 million for scholarships at the School of Medicine, Skaggs School of Pharmacy and Pharmaceutical Sciences and Herbert Wertheim School of Public Health and Human Longevity Science.

Carethers has challenged our alumni, friends and donors to join in raising an additional \$12 million over the next four years, effectively doubling the impact for our students. Support for the challenge will ensure the best and brightest have access to a world-class education. ●

→ **Jeff and Nancy Stack** generously established the Gene Therapy Initiative at UC San Diego to accelerate gene therapy research and expand access to innovative treatments.



# A Business Model for Academic Research Excellence

An essay by Corinne Peek-Asa, PhD,  
Vice Chancellor for Research.

UNIVERSITY RESEARCHERS ARE PROVIDING scalable solutions to difficult everyday problems thanks to a concerted focus on enterprise collaborations that extend beyond the academic sphere. But commercialism stemming from university research goes beyond business as usual.

UC San Diego researchers have repeatedly demonstrated that we are interested and actively responding to the needs of our community by addressing concerns that many thought were unsolvable. Our researchers are making their most viable ideas, processes, tools and creative pursuits accessible for use in our region and around the world.

As places where knowledge thrives and brilliant minds collaborate, universities benefit from a wealth of ideas and creative pursuits. We never want our academic

spaces to lose the freedom, agency and security to explore, learn, fail, reexamine, refine and try again, but the concept of driving a monumental impact on society includes the way in which we make viable innovation accessible in the marketplace.

Our Office of Research & Innovation, which includes our Office of Innovation and Commercialization, is not just cheering on these developments — we are partnering with researchers to expand the potential of their work and make commercial success more viable.

To name just one group fueling commercial innovation on campus, a growing number of health sciences researchers are working in larger collaborative groups, using novel tools and spinning their discoveries into ambitious new biotech startups.

In the 2022–2023 fiscal year, there were 390 unique disclosures of viable inventions. Disclosures are a necessary first step to obtaining a patent by announcing that a new idea, process or technique is being proposed. This starts a verification process that vets the uniqueness of the proposed idea before patents or licenses can be issued.

Our UC San Diego disclosures led to more than 200 new U.S. and non-U.S. patents and 15 new business startups. This puts our university among the top three nationwide for business startup creation, according to the Association of University Technology Managers.

The largest area of growth consistently comes from our School of Medicine because of the collective strength, consistency and ingenuity of our faculty and researchers in this field. Every quarter, collaborations grow and more initiatives develop.

UC San Diego School of Medicine leads all other schools on campus with 55 new invention disclosures, 22 patents in the U.S. and abroad, as well as three new startups.

And it will be no surprise that Jacobs School of Engineering is the second most industrious, with 45 disclosures in fiscal year 2023. They are another highly collaborative group whose innovations often straddle different divisions, schools of thought and industries — from humanities to biological science, sustainable building materials to eco-friendly apparel lines.

Among the most celebrated efforts in innovation this year has been Limber Prosthetics & Orthotics, Inc., a medical device startup. Limber has garnered some warranted attention lately for an inventive process that is revolutionizing access to prosthetic limbs.

As one of the world's first companies 3D printing below-the-knee prosthetic limbs, the three-year-old company launched by two UC San Diego Jacobs School of Engineering alumni and a certified prosthetist and orthotist has generated groundbreaking results.

← With support from UC San Diego, medical device startup Limber provides patients with customized prosthetic limbs.

They have attracted more than half a million dollars in funding, including \$250,000 from UC San Diego. This investment is a first among any UC campus, and it is a testament to Chancellor Pradeep K. Khosla's resolve to lend support to promising startups that have the ability to transform industries, change lives and contribute solutions for societal good.

Limber is not only generating personalized limb replacements using a process that is individualized, faster, cheaper and better fitting, the company also has the ability to transform lives with a cell phone and a viable internet connection. The solution requires minimal equipment and training for users, maximizing the impact it can have in remote areas during difficult times.

Together, our researchers are working to create a more inclusive and accessible community with an ever-broader scope of interests and pursuits.

This includes startups from our newly launched Talent Foundry, a business scaling program focused on increasing the number and size of diverse startups in San Diego. From biotech, tech and tech-enabled businesses, they consult directly with more than 50 companies, connecting them with resources and opportunities. It's a thriving program to make entrepreneurship available to people outside of the university who have great ideas and come from areas that have traditionally been left in the margins of the startup culture.

The program has already yielded some impressive contenders, including Docfully, a compassionate and innovative effort to address the medical needs of the city's unhoused population. By contracting with hospitals to supplement care, they hope to save medical systems and taxpayers hundreds of millions by meeting the needs of this vulnerable population, thereby averting costly medical emergencies.

Docfully was founded by Jacques Stroud, a former emergency medical technician and home health care nurse who saw a market opportunity that could help meet a crushing societal need.

Stroud initially joined the university program aimed at members of the

community, but now he has better access to university connections.

Other teams originating on campus are also working across campus borders to develop new therapeutics, surgical techniques, medical devices, drug therapies and customized care.

UC San Diego Health's Center for Health Innovation is just one of the hubs on campus where great minds can collaborate on extraordinary goals. Funded by a \$22 million grant from Joan and Irwin Jacobs, the newly announced expansion to Jacobs Medical Center will use artificial intelligence and monitoring technologies to track patient outcomes as we continue to expand on the possibilities of patient care (see page 26).

The real-world implications and problem-solving aspects of research activities are paramount.

Professors and serial entrepreneurs like Gene Yeo, PhD, MBA, contribute to a culture where academia is active in solving

real-world problems. He has authored more than 70 peer-reviewed publications, invited book chapters, review articles and has served as an editor on several books.

He has also started a succession of successful startups in the biotechnology space and is funded by grants from the National Institutes of Health, California Institute for Regenerative Medicine, the ALS Association, Genentech and Roche Pharmaceuticals.

It is now the norm for researchers to actively and fervently seek methods to improve how they share their discoveries in the public sphere for economic, social and public health benefits — often reducing costs, improving efficiency and expanding capabilities.

We will continue bringing our regional innovation community together with our university innovators to create a dynamic environment that accelerates the development of entrepreneurial talent and impact-driven companies. ●



↑ Corinne Peek-Asa, PhD, is the Vice Chancellor for Research overseeing the Office of Research & Innovation, which plays a key role in the university's billion-dollar research enterprise.



# SINCE 1983: AHEAD OF ITS TIME

The Stein Institute for Research on Aging celebrates 40 years of thought leadership in aging research.

BY MILES MARTIN

IN 1983, UC SAN DIEGO SCHOOL OF MEDICINE became the first campus in the UC system to have an Organized Research Unit devoted entirely to research on aging. Renamed in 1992 after a generous gift from the Stein family, the Sam and Rose Stein Institute for Research on Aging promotes lifelong health and well-being through groundbreaking research, community education and training the next generation of researchers.

“In the past 40 years, the Stein Institute has grown from a small group of researchers to a leading academic research center, recognized locally and nationally for its impact on the field of aging,” said **Alison Moore, MD, MPH**, interim director of the Stein Institute. “Our Institute brings

together a critical mass of scientific talent, encourages and funds aging-related research, supports education and conducts community outreach to share the latest research with those we aim to serve.”

The Stein Institute recently celebrated its 40th anniversary and continues to innovate, taking a new stance on aging research that asks not just how we can prevent the diseases and negative effects associated with aging but also how we can help people age successfully and with the highest quality of life.

“There are researchers around the world looking at what goes wrong during the aging process, but we want to take a different approach and focus on what goes



↑ **Dilip Jeste, PhD** (center), served as director of the Stein Institute for Research on Aging from 2004–2022.

1. **Jarvis Edwin Seegmiller, MD**, was the founding director of the first University of California Organized Research Unit devoted to aging, where he served from 1983–1990.
2. UC San Diego's aging research unit underwent construction as part of its expansion in the early 1990s.
3. In 1992, the research unit was renamed the Sam and Rose Stein Institute for Research on Aging, after a generous endowment from **Sam and Rose Stein**.

right with aging,” said Executive Director Danielle Glorioso, who has been with the Stein Institute for nearly two decades. “We look at things like resilience, wisdom, optimism and social engagement. We’ve seen firsthand that people really care about aging better, living longer and enjoying the best quality of life.”

This hasn’t always been the institute’s mission. In its earliest days, the Stein Institute for Research on Aging was like most other academic centers for aging

research, focusing on specific diseases and conditions like frailty, Alzheimer’s and Parkinson’s. However, this all changed in the early 2000s, when the institute pivoted to studying successful aging rather than diseases of aging.

“We were really ahead of the curve when it came to looking at healthy aging, and we’ve had such a positive response from the community since making the change,” said Glorioso.

This positive spin on aging research then spread to the rest of UC San Diego, which in 2014 established the Center for Healthy Aging, an umbrella organization for all age-related research at the university. It continues to expand upon the groundbreaking work of the Stein Institute.

“We anticipate that we will continue to focus on healthy aging, as there is so much to be learned in this space,” said Moore. “It’s also a theme that, with good reason, is of great interest to older adults and those who one day hope to be older adults.”

## Age Is Not Just a Number

According to Anthony Molina, PhD, interim scientific director of the Stein Institute, promoting healthy aging also requires a deeper understanding of the biological factors underlying the aging process. Molina is at the helm of UC San Diego’s Geroscience Laboratory, which seeks to develop, test and apply predictive biomarkers of human aging.

“People who share the same chronological age vary widely with regard to their burden of age-related conditions and long-term health trajectories,” said Molina. “Our goal is to apply cutting-edge scientific approaches to research that seeks to improve the quality of life of older people.”

While a number of biological hallmarks of aging have been identified, there are still limited methods to track how these change over time and might be affected by interventions to promote healthy aging.

One key area of interest for Molina’s group is the function of mitochondria, the parts of our cells that convert nutrients

into energy. Their research shows that mitochondrial dysfunction can contribute to aging in a variety of ways. When our cells lack sufficient energy, this leads to a breakdown of important metabolic processes and causes irreparable damage to the cells. This “energy crisis” thus underlies the progression of many age-related diseases and conditions.

Molina and his team have discovered that the activity of mitochondria can be measured with a specific type of blood test, making it possible to investigate ways to preserve, or possibly improve, mitochondrial function in older individuals. Using this test, his team has shown that levels of mitochondrial function are related to the physical and cognitive abilities of older adults. His team is now using these and other state-of-the-art tests to identify strategies to promote healthier physical and mental aging.

“We are seeking to develop personalized treatments for older adults,” said Molina. “Reliable reporters of biological age will help us advance precision health care by accounting for an individual’s unique physiology, and this new level of precision represents the future of aging research.”

### The Science of Resilience

While it’s important to develop ways to measure the biological indicators of age, aging also has social and emotional components that require further investigation.

One way the Stein Institute integrates the biological and social drivers of aging is through the ongoing UC San Diego Successful Aging Evaluation (SAGE) Study. This long-term study began in 2010 and is a lifespan aging study that aims to identify the factors associated with successful aging throughout the course of life.

The study includes 1,800 randomly selected San Diego residents from ages 20 to over 100 years old and uses a comprehensive annual survey to assess a myriad of parameters associated with aging. These include physical factors like diet and mobility but also psychosocial factors like emotional well-being and resilience or the ability to cope with life’s hardships.

Resilience is of particular interest to Glorioso, who is a social worker by training. Older adults are uniquely vulnerable to life’s hardest experiences, including the loss of family and loved ones, physical decline and social isolation. These challenges are not only emotionally distressing but can also contribute to chronic illnesses

associated with aging. This prompted Glorioso to ask what can be done to promote resilience.

“We started looking at the literature and found that resilience was associated with improved physical health, mental health and longevity. Given that our mission has been to help enhance overall health and well-being, we got to wondering if we could develop a program to enhance resilience, which we hoped would, in turn, improve quality of life and promote longevity,” said Glorioso.

She and her colleagues created a program called Raise Your Resilience, designed to help adults increase their resilience by promoting compassion, self-compassion, empathy, gratitude and value-driven activities. They developed a manual for three- and six-session programs and tested it in older adults in both a group format and one-on-one. By partnering with senior living communities and academic collaborators, they were able to test this program in California, Arizona, Illinois and abroad.

The researchers found that the program didn’t just help people increase their resilience — it also reduced participants’ perceived stress and depression.

Since this initial pilot, they’ve demonstrated the effectiveness of the Raise Your Resilience program in other formats and contexts, including delivering it remotely during the pandemic. The program has proven so successful that it is now available for licensing, allowing the broader community who work with older adults to provide the best care possible.

“The skills involved in building resilience are important for everybody,” said Glorioso. “We’ve already created a version of the program for caregivers of those with Alzheimer’s and dementia, and we’re also looking into adapting it for younger populations, such as high school students. While our research has the most direct impact on older adults, it’s important to us that our work reaches the wider community as well.”

← **Stein Institute for Research on Aging** faculty and staff gather in front of the completed research facility in the 1990s.



### Engaging the Community

One of the cornerstones of the institute’s recent work has been the establishment of a Living Lab at Belmont Village Senior Living, a collaboration that grew out of the success of the Raise Your Resilience program. The lab, which officially opened in 2023, aims to engage older adults in the scientific research process as active participants and collaborators, not just research subjects.

“We want our research to reflect what matters most to the people we’re studying, not just our own priorities as scientists,” said Molina. “The best way to do that is to work closely with senior living residents and get their input on what we should be working on.”

The Living Lab is currently conducting informational interviews with Belmont Village residents to learn more about the lifestyles and behaviors that promote healthy aging. By directly connecting scientists at UC San Diego with seniors in the community, the Living Lab fosters

an unprecedented level of collaboration between these groups.

“I have had the chance to be involved with a number of projects and initiatives in my time as interim director, and none stand out to me more than this one,” said Moore. “I feel strongly that this is just the beginning of a new model for aging research. The Living Lab is our first step at creating a home for scientific research and interdisciplinary partnership that can impact residents right where they live, which will help us pursue work that is aligned with the needs of the communities we serve.”

Living Lab leaders believe the partnership with Belmont Village can benefit not just the Stein Institute but also the wider UC San Diego scientific community. They envision the Living Lab as a resource for researchers at UC San Diego School of Medicine, Jacobs School of Engineering and the Sanford Institute for Empathy and Compassion. They also hope the lab will serve as a model that can be brought

↑ **The Living Lab** is currently conducting informational interviews with Belmont Village residents to learn more about the lifestyles and behaviors that promote healthy aging.

to various communities throughout San Diego County, including those that are more diverse or historically disadvantaged.

To further extend their reach, the institute is also in the process of establishing a consortium of academic aging centers across the country. This consortium will foster new collaborations and help share insights from the Living Lab, the SAGE study and other Stein Institute initiatives.

“One of the things that makes the Stein Institute so special is its capacity to serve as a resource to scientists in the UC San Diego community and around the country,” said Molina. “What makes a great academic research center is people with unique skills, expertise and resources coming together to solve problems. This is what the Stein Institute has made its legacy doing and what it will continue to do well into the future.” ●



# SHOOTING FOR THE STARS

UC San Diego scientists are sending cells into space and health science into the future.

BY NICOLE MLYNARYK

→  
In addition to her research, **Catriona Jamieson, MD, PhD**, is also a board-certified hematologist at UC San Diego Health.



For biomedical research at UC San Diego, the sky is no longer the limit.

Over the last five years, the university has become a pioneer in performing health science research in space. In a series of successful launches, UC San Diego scientists have sent various types of stem cells aboard the ISS, where the unique microgravity environment offers an unparalleled view into the molecular mechanisms of cancer and aging.

Much of the work is led by researchers affiliated with the UC San Diego Sanford Stem Cell Institute, established in 2022 with a \$150 million gift from philanthropist T. Denny Sanford. Through collaborations with the National Aeronautics and Space Administration (NASA) and a growing list of space and biotech industry partners, the institute is now expanding its space programming across research, commercialization and education efforts.

“Microgravity is an extremely stressful environment for cells, so by conducting experiments in low Earth orbit, we are able to understand mechanisms of aging, inflammation and cancer evolution in a compressed time frame and then use these findings to inform new therapeutic strategies,” said **Catriona Jamieson, MD, PhD**, professor at UC San Diego School of Medicine and director of the Sanford Stem Cell Institute. “If there is anything that our work has taught us so far, it’s that the future of stem cell science is in space.”

**JESSICA PHAM STARED AT THE GREY SKIES ABOVE** her with nervous anticipation. She had arrived at the Kennedy Space Center that morning with a shipment of precious cargo: multiple batches of human stem cells.

Over the previous month, Pham had meticulously tended to these cells, preparing them for their upcoming journey to the International Space Station (ISS). But after Pham and her samples were both overnights to Florida, a dense layer of clouds had stalled the next leg of the trip.

“All you need is a five-minute window of clear skies for the rocket to be able to launch,” said Pham, a senior researcher in the Jamieson Lab at UC San Diego School of Medicine.

The rocket she refers to is a SpaceX Falcon, which routinely ships supplies into low Earth orbit to restock the ISS. Researchers like Pham are now taking advantage of these commercial launches to send experiments to space.

Suddenly, the fog began to lift over the launch site — along with the scientists’ spirits. A rush of action followed, and before they knew it, the rocket was in the air and out of sight.

“Suddenly everyone around me was cheering and my family was calling to congratulate me from San Diego,” said Pham. “But it never really hits me until the day after. In those first few moments, it’s still all too surreal. I never thought anything I was working on would ever end up in outer space.”



## Why study cells in space?

WHEN ASTRONAUT SCOTT KELLY returned from a year-long trip aboard the ISS, subsequent lab tests revealed numerous molecular changes in his blood. After this extended time in space, his blood cells showed DNA damage, shortened telomeres and heightened levels of precancerous markers. These sorts of things can be observed in blood cells on Earth, but only after decades of human aging.

Studies since have supported the idea that the lack of gravity and exposure to the sun's radiation in space can accelerate aging in human cells and promote their transformation into cancer cells. This is especially dangerous when it occurs in stem cells, such as those that produce our blood.

Adult stem cells are unspecialized cells that have yet to develop into a particular cell type. Under the right conditions, stem cells divide and turn into more specialized cells with a distinct function, such as blood cells, brain cells, bone cells or liver cells.

These properties make stem cells critical to the body's ability to maintain and repair healthy tissues across a lifetime. But just like other cells in the body, stem cells also experience a progressive decline in their health and numbers as people age. This in turn reduces the body's ability to regenerate new tissue, causing joints, blood vessels and other organs to weaken over time.

Stem cells also live much longer than the more specialized cells they are designed to replace. This increases their chance of accumulating genetic mutations over time. It often only takes a few mutations



↑ Rising stars **Jessica Pham** (left) and **Jane Isquith** (right) use space to study stem cell health in the Jamieson Lab at UC San Diego.

for a cell to lose control over itself and start rapidly dividing, so stem cells are also especially prone to becoming the source of a cancerous tumor.

Physicians and scientists were therefore startled to find that the stressful environment of space was aging astronauts' cells at such a rapid pace. Stem cell experts at UC San Diego immediately began to explore what was happening inside these cells, with the understanding that this would not only help us keep astronauts healthy but could also teach us how to treat cancer and aging on Earth.

→ **Jessica Pham** prepares a "payload" of stem cells that will soon travel aboard NASA's ISS.

## "The future of stem cell science is in space."

CATRIONA JAMIESON, MD, PHD

Researchers at the Sanford Stem Cell Institute are now using space as an "aging accelerator." The studies will help scientists and clinicians understand the cellular and molecular mechanisms of stem cell aging, inflammation and cancer, all without having to rely on lengthy and expensive clinical trials monitoring Earthbound humans as they age or develop disease in real time.

Already, their initial experiments have confirmed that even in cultured cells, exposure to the microgravity environment of low Earth orbit can lead to precancerous genetic mutations, changes in telomere length and massive bursts of cell division.

SHOOTING FOR THE STARS

"It's increasingly clear that the way stem cells age depends on what they are exposed to, and the more we understand this process, the more precisely we can intercept cancer development and turn back the clock on human aging," said Jamieson.

While sending cells into space might seem strange to some, the researchers point out that terrestrial labs already rely on artificial experimental manipulations to try to simulate the effects of aging.

"Whether we're looking at aging mice, putting cell cultures under oxidative stress or manipulating genes associated with aging, we're always seeking ways to model these processes at a more efficient scale," said **Alysson Muotri, PhD**, professor at UC San Diego School of Medicine and co-director of the UC San Diego Stem Cell Program. "Now we're taking a different approach to speed up the aging process and studying how it plays a role in cancer, liver disease and neurodegeneration."



← **Alex A. Huang, MD, PhD**, is a board-certified ophthalmologist at the Shiley Eye Institute at UC San Diego Health.

Huang. "For the eye, we don't have a strategy at all."

To address this, Huang first equipped the ISS with clinical tools for monitoring astronauts' eyes before, during and after spaceflight to better understand the changes as they occur.

He and his collaborators also developed a microgravity simulation on Earth in which participants spend time lying on tilted beds that position the head below the level of the feet. Eventually, they showed similar eye effects. They are now using this bed rest model to test various techniques for trapping body fluids toward the legs and away from the head.

Most recently, Huang began working with data science experts at UC San Diego to create artificial intelligence tools that can predict which individuals are more or less likely to develop eye problems in space. He hopes that in the future, these tools might help NASA and other groups confirm which astronauts are best suited for longer-term missions.

"There's this growing interest in commercial spaceflight and long-haul space missions, but we need the new discipline of space medicine to advance along with them," said Huang. "We can't send people to Mars if they can't see well enough to land back on Earth."

Huang was recently named one of the first endowed chairs at the Viterbi Family Vision Research Center at Shiley Eye Institute (see page 20). The new center will foster the type of collaboration and innovation that space medicine requires.

"The center was thoughtfully designed to encourage interaction and push people to talk about things they hadn't considered doing before," said Huang. "We really have a chance to take a swing and answer the hard questions in eye health, and the impact of that will be felt both on Earth and in space."

VISIONARY SCIENCE:

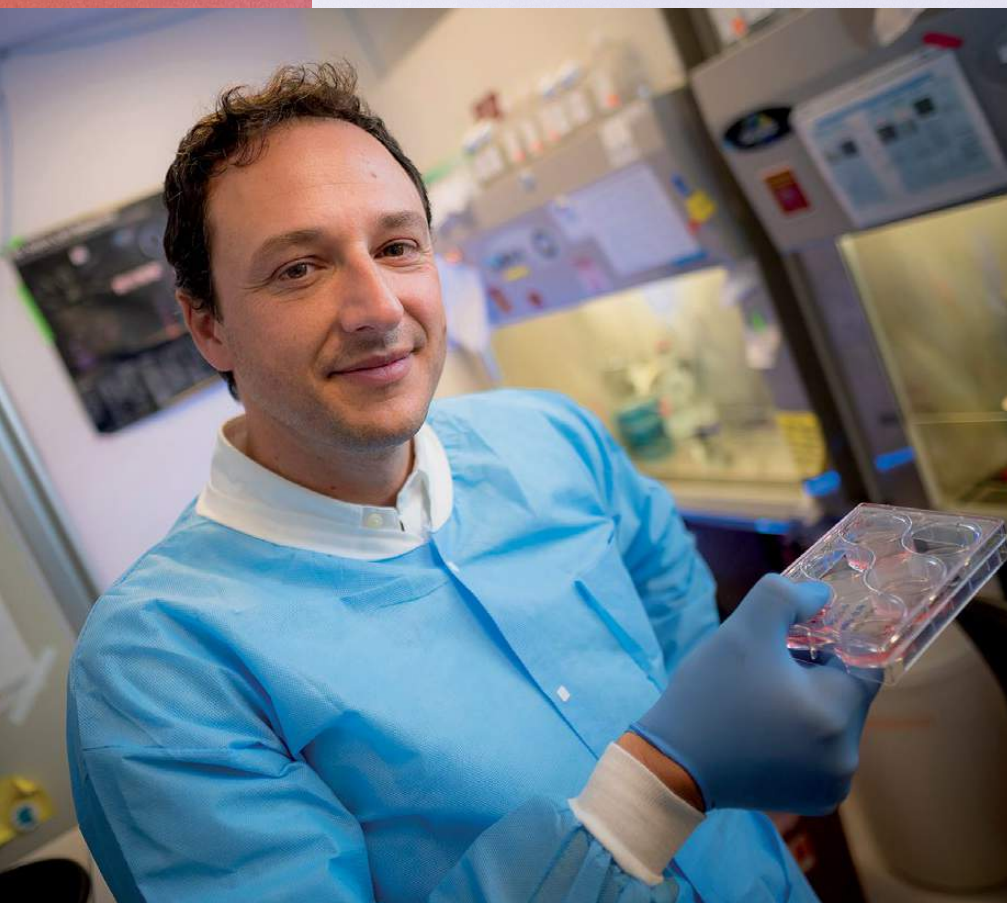
## UC San Diego is leading the charge in another branch of space medicine – eye health.

When NASA introduced eye exams into their health screenings in 2010, they noticed astronauts often needed new glasses prescriptions after returning from space. Further tests revealed changes to their eye structure and function, including significant swelling of the optic nerve – the cable that sends visual information from the eyes to the brain.

NASA soon recruited the help of clinician-scientist **Alex Huang, MD, PhD**, an ophthalmologist at Shiley Eye Institute at UC San Diego Health. Huang now leads research to determine the cause of Spaceflight-Associated Neuro-Ocular Syndrome. In 2024, Huang will be the keynote lecturer at the NASA Human Research Program Investigators' Workshop.

Huang says the optic nerve swelling is likely due to a buildup of fluid in the astronauts' heads. On Earth, gravity pulls the body's fluids toward our legs, but in the microgravity of space, this fluid is free to redistribute up toward the eyes.

"The conditions in space affect many parts of the human body, but for things like muscles and bones, we have good strategies to manage those effects," said



## Gaining momentum

FOLLOWING A SERIES OF SUCCESSFUL pilot studies, UC San Diego is now significantly expanding its scope of space research.

In one of their earliest experiments, Jamieson and colleagues found that several precancerous markers were elevated in blood stem cells after one month in space. Of particular note was the activation of ADAR1, an enzyme that edits RNA and promotes cancer proliferation and drug resistance.

In a follow-up study in 2023, the scientists sent tumor organoid models of leukemia, colon and breast cancer aboard the ISS and observed whether these cells behaved similarly to the blood stem cells. They also tested two ADAR1 inhibitors, Fedratinib and Rebecsinib, to see if the drugs could reverse the effects and prevent cancer progression. These experiments mark the start

of a developing program to expand translational research and drug development in space.

Another line of experiments monitors the health of astronauts' stem cells over time to learn how they are affected by spaceflight. Blood samples are collected from crew members before, during and immediately after the mission, followed by annual exams over the next five years. The longitudinal study will track the effects of the space environment on stem cell aging, immune function and cancer stem cell generation.

Research led by **Tatiana Kisseleva, MD, PhD**, professor at UC San Diego School of Medicine, is investigating the effects of stress and aging on liver stem cells. Kisseleva studies and treats ailments of the liver, such as fibrosis and steatohepatitis, a type of fatty liver disease. Her group is now interested in learning the impact of microgravity on liver function, which could provide insights into its

↑ **Alysson Muotri, PhD**, leads the Integrated Space Stem Cell Orbital Research Center at UC San Diego with Catriona Jamieson, MD, PhD.

dysfunction on Earth and the potential effects of space travel.

Another branch of research led by Muotri's lab focuses on the effects of low Earth orbit on neural stem cells and brain organoids.

"Our data shows that microgravity can accelerate the aging of brain cells," said Muotri. "We can now use this to simulate neurological aging and create novel laboratory models for late-onset diseases, such as Alzheimer's and dementia."

In 2023, Muotri's group began a new series of launches to further explore the molecular and cellular mechanisms of neurodegeneration in space.

"One month in space seems equivalent to about 10 years on Earth, so if we keep these brain organoids up there for six months, this could reveal a lot about the changes that occur in brain cells across our lifespan."

Muotri says he's already been approached by pharmaceutical companies interested in testing Alzheimer's drugs on these rapidly aging organoids. He suggests that in the future, space stations could become factories for producing organoid models of aging-associated diseases.

"The progress isn't incremental — it's explosive," said Jamieson. "I've never seen this level of scientific might coming together to support a new line of work."

## Commercializing space

THE SUCCESS OF THE UNIVERSITY'S SPACE research program is due, in part, to its strong collaborations with leaders in the space and biotech industries. These partnerships have allowed UC San Diego scientists to develop novel protocols for sending human cells aboard space stations and maintaining them there over weeks or months.

In a lab on Earth, cell cultures like these require constant

maintenance by research staff, who ensure the cells are taken care of and getting all the nutrients they need to stay alive. To do this in space, the researchers relied on the CubeLab, a custom device designed and built by engineering company Space Tango to automate cell maintenance and allow researchers to monitor data remotely from Earth.

The researchers also forged partnerships with Axiom Space and Sierra Space, two companies leading the way in aerospace transportation. Future studies could take place on Axiom's new commercial space station, equipped with state-of-the-art laboratory space and trained research staff.

With these pipelines in place, the Sanford Stem Cell Institute is increasingly focused on expanding its basic research findings into clinical trials and commercial products. This includes manufacturing novel drugs, biofilms and stem cell therapies in space, where the conditions make assembly faster and more cost-effective.

The institute is now developing strategic collaborations with San Diego biotechnology companies and global manufacturers to help execute this mission. This new

**"This is just the beginning of a long line of exciting and impactful health science advances that will be enabled by space."**

CATRIONA JAMIESON, MD, PHD

Jessica Pham (left) and Jane Isquith (right) helped develop the CubeLab. ↓



industrial engine will help assess what aspects of scientific manufacturing can be done bigger, better and faster in space.

"It's becoming evident that space is a great place to do science and to translate discoveries into tangible goods," said Jamieson. "The next thriving ecosystem of stem cell companies will be 250 miles overhead."

Institute leaders say they're witnessing the emergence of a new

global economy based in space. While this creates new opportunities, it also inspires new questions.

"If we make discoveries and eventually new products in space, who owns and regulates that?" asked Jamieson. "We don't have a way of even thinking about that yet. Right now, it's the Wild West up there. We want to work with governmental agencies to get ahead of that. The sooner we do, the sooner patients will benefit."

## Training a space biologist

WHEN DESCRIBING THESE PROJECTS, Jamieson frequently notes the dedicated work of her lab staff, who have taken on the challenge of pioneering an entirely new research program.

"We put in so much effort to get this to work," said Pham, who now serves as the lab's first Stellar Mission Specialist. "The end product is very glamorous, but the process to get there was tough."

To address the unique challenges of this work, institute leaders say we'll need increased training and specialization of research staff, both on Earth and in space.

"You don't need to be a pilot or a race car driver to go to space anymore," said Jamieson. "In our current model, we train astronauts to be cell biologists, but I think the future will have cell biologists training to be astronauts."

The Sanford Stem Cell Institute now aims to develop and fund educational programming to train a new generation of space biologists.

"With the growing support of NASA, philanthropic funders and our partners in commercial spaceflight, this is just the beginning of a long line of exciting and impactful health science advances that will be enabled by space," said Jamieson. "The time to invest in space science is now." ●

# In Pursuit of Health Equity

An essay by Crystal Wiley Cené, MD, chief administrative officer for health justice, equity, diversity and inclusion at UC San Diego Health.

MANY WITHIN HEALTH CARE ARE FAMILIAR WITH the Quadruple Aim of Healthcare: enhancing patient experience, optimizing population health, reducing costs and improving the well-being of health care providers. As greater emphasis was placed on achieving the core components of the quadruple aim, it became exceedingly clear that the quadruple aim was insufficient, in and of itself, to improve the delivery of high-quality care without an explicit focus on health equity. Quality without equity is not the goal and, in fact, should be viewed as a hollow victory. In this essay, we define health equity and highlight efforts to advance it at UC San Diego Health.

While the term “health equity” has been used more frequently over the past couple of decades, there are multiple definitions and no single “gold standard.” However, the most critical elements are generally the same across definitions. The UC San Diego Health definition of health equity is as follows:

*Health equity means that everyone has a fair and just opportunity to be as healthy as possible.*

*Health equity means reducing and ultimately eliminating disparities in health and in the determinants of health that adversely affect excluded or marginalized groups.*

Health equity and health inequities are inter-related concepts. Health equity is the justification and motivation for eliminating health inequities, which are defined as avoidable differences in health or in key social determinants of health (e.g., access to food, housing, education, jobs and health care) that adversely affect historically marginalized and excluded groups.

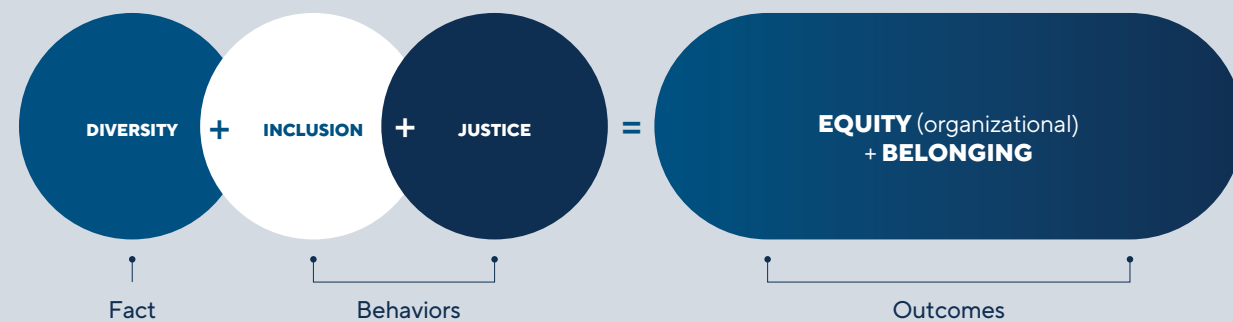
Health inequities are rooted in differences in access to opportunities and resources needed for health that result from intentional societal decisions that were embedded in our laws, policies and practices. These political determinants of health created the social determinants, including poor environmental conditions,

inadequate transportation, unsafe neighborhoods and a lack of healthy food options or affordable housing. Health inequities are considered unfair and unjust because they could plausibly be avoided, given political will.

Health inequities affect many populations, including those who identify as Black, Hispanic/Latinx, Indigenous Americans or LGBTQ; individuals in rural communities; individuals living in socioeconomically disadvantaged communities; individuals who are differently abled; older adults; and individuals with multiple intersecting identities. Health inequities are persistent, pervasive and have been well-documented for more than two decades.

Recently, national organizations and public reporting agencies have sharpened their focus on health equity by releasing health equity frameworks, identifying health equity priorities and putting forth health equity requirements that hold health systems accountable for advancing health equity.

At UC San Diego Health, we have accepted the challenge and embrace the opportunity to become national leaders in advancing health equity. Advancing health equity for our patients is our “true north.” We recognize that improving the diversity of our current and future workforce is an important strategy for advancing health equity. However, we do not conflate diversity, equity and inclusion (DEI) efforts with health equity. We use the “formula” below to ground our work:



Diversity is a fact — our teams either reflect or do not reflect the diversity of the populations we serve. Inclusion and justice (efforts to combat oppression and marginalization in any form) are explicit behaviors we must demonstrate. Equity (at the organizational level) and belonging (at the individual level) are the outcomes we desire.

In response to the advocacy of our medical students following the nationwide racial reckoning sparked by George Floyd’s murder and the widespread health inequities highlighted by the COVID-19 pandemic, UC San Diego Health Sciences took decisive action by creating an anti-racism task force, with nine work streams embedded across our institutions to guide the initial work. UC San Diego Health also made “Dismantling Structural Racism” a pillar within the organization’s strategic framework.

They also hired me, a general internal medicine physician and health services/health equity researcher, as the Chief Administrative Officer for Health Equity, Diversity and Inclusion and the Associate Chief Medical Officer for Health Equity, reporting to the Chief Executive Officer, Patty Maysent.

In January 2022, I formed the UC San Diego Health Department of Justice, Equity, Diversity and Inclusion (JEDI), which currently has six full-time team members. The JEDI Department has identified five strategic priority areas and is currently engaged in multiple initiatives within each area. The goals of each priority area are to:

1. Strengthen structures, policies and practices to enhance health equity and dismantle structural racism.
2. Expand the collection, reporting and analysis of standardized data to identify health inequities.
3. Implement data-driven and evidence-based initiatives to eliminate health inequities.
4. Foster and invest in the health and economic well-being of the local communities we serve.
5. Be recognized as a leading health system in health equity.



↑ Crystal Wiley Cené, MD, also serves as Associate Chief Medical Officer for Health Equity at UC San Diego Health.

These priorities are being expressed in a variety of ways. In one of our first projects, we developed and conducted three 90-minute knowledge-building sessions, with more than 350 health system leaders participating in each. These sessions covered topics such as the history of racism and anti-racism in medicine, ways to create accountability toward racial equity and the importance of unpacking privilege, power and biases.

We then held multiple “fishbowl listening sessions” to foster an environment where it was safe to speak about difficult topics, such as race and racism. These meetings helped inspire our new educational video series, which includes lessons on structural racism and strategies to dismantle it, how to talk about race in the workplace and the significance of dead, lived and preferred names.

We’ve now facilitated multiple team-based discussions with senior leaders and their teams (~1500–2000 individuals), centering around the TEDx Talk, “Allegories on Race and Racism” by Dr. Camara Jones. We also developed and

conducted a facilitator training workshop to expand our team of trained health equity advocates, so these conversations can continue outside of our scheduled events.

In addition to this educational programming, we’re improving our data collection and analysis protocols through the new Health Disparities Data & Analytics Steering Committee. This also helps us disseminate our progress through publications, presentations and national certification programs for health equity.

UC San Diego Health has also joined the Health Care Anchor Network, a national collaboration of more than 75 health care systems committed to building more inclusive and sustainable local economies.

These activities are just the start of a growing strategy to strengthen the foundation of health equity that our health system is built upon. The commitment of our students, staff and faculty to learn, live and spread these ideas has been inspiring, and we’re so excited to see the impact it will continue to have on our patients and their communities. ●

# TRANSFORMATION CONTINUES

The future of UC San Diego life sciences, vision research and outpatient care is on the horizon.

BY NICOLE MLYNARYK

THE UC SAN DIEGO CAMPUS CONTINUES TO evolve with the expansion of Health Sciences facilities in La Jolla and Hillcrest.

But these are more than just buildings — they're solutions to our problems, investments in our future and promises to our community. With each new structure, our academic medical center strengthens its tripartite mission of excellence in education, research and clinical care.

The projects are part of UC San Diego's first-ever Strategic Plan — a decision-making framework designed to create a student-focused, research-centered and service-oriented public university. Under the leadership of Chancellor Pradeep K. Khosla, more than \$7 billion has been invested in new medical, research, education and housing facilities across San Diego.

The next three projects slated for completion are the Viterbi Family Vision Research Center, the Hillcrest Outpatient Pavilion and the Multidisciplinary Life Sciences Building.

See our previous issue at [discoveries.ucsd.edu](https://discoveries.ucsd.edu) for a full visualization of past, current and planned development at UC San Diego Health Sciences.

## Breaking Ground

UC San Diego's vision research and care is undergoing a significant and exciting

expansion to help patients with their eye care needs thanks to support from many generous supporters, including Darlene Shiley, Andrew J. Viterbi and Hanna and Mark Gleiberman.

In the spring of 2023, the campus broke ground on the Viterbi Family Vision Research Center, supported by a \$50 million gift from philanthropist Andrew J. Viterbi, PhD. The center will house experimental and computational laboratories, clinical trial operations and administrative spaces, all designed to advance research on various ophthalmological diseases. The five-story, 100,000-square-foot facility is located on the La Jolla Campus of UC San Diego Health, next to the Shiley Eye Institute, and is slated for completion in 2025.

The Shiley Eye Institute is also undergoing renovations thanks to a \$10 million gift from Darlene Shiley. As researchers move from the second floor of the institute into the new Viterbi Family Vision Research Center, it will free up additional clinical space to care for the rapidly growing number of patients who visit the Shiley Eye Institute each year.

The Viterbi Family Vision Research Center will also be home to the newly established Hanna and Mark Gleiberman Center for Glaucoma, which was funded by a \$20 million gift from the Gleibermans. Research on macular dystrophy, a retinal

“With this investment, our leading-edge researchers will be empowered to conduct groundbreaking research to find new treatments and cures for vision loss and eye disease, significantly advancing health care around the world.”

Pradeep K. Khosla, UC San Diego Chancellor



condition that can result in vision loss, will take place in the center as well, thanks to support from the Nixon Visions Foundation.

“With this investment, our leading-edge researchers will be empowered to conduct groundbreaking research to find new treatments and cures for vision loss and eye disease, significantly advancing health care around the world,” said Chancellor Pradeep K. Khosla.

Once dispersed across multiple sites on campus, the UC San Diego ophthalmology community will now be united in one central location where scientists can easily translate their findings to the clinic.

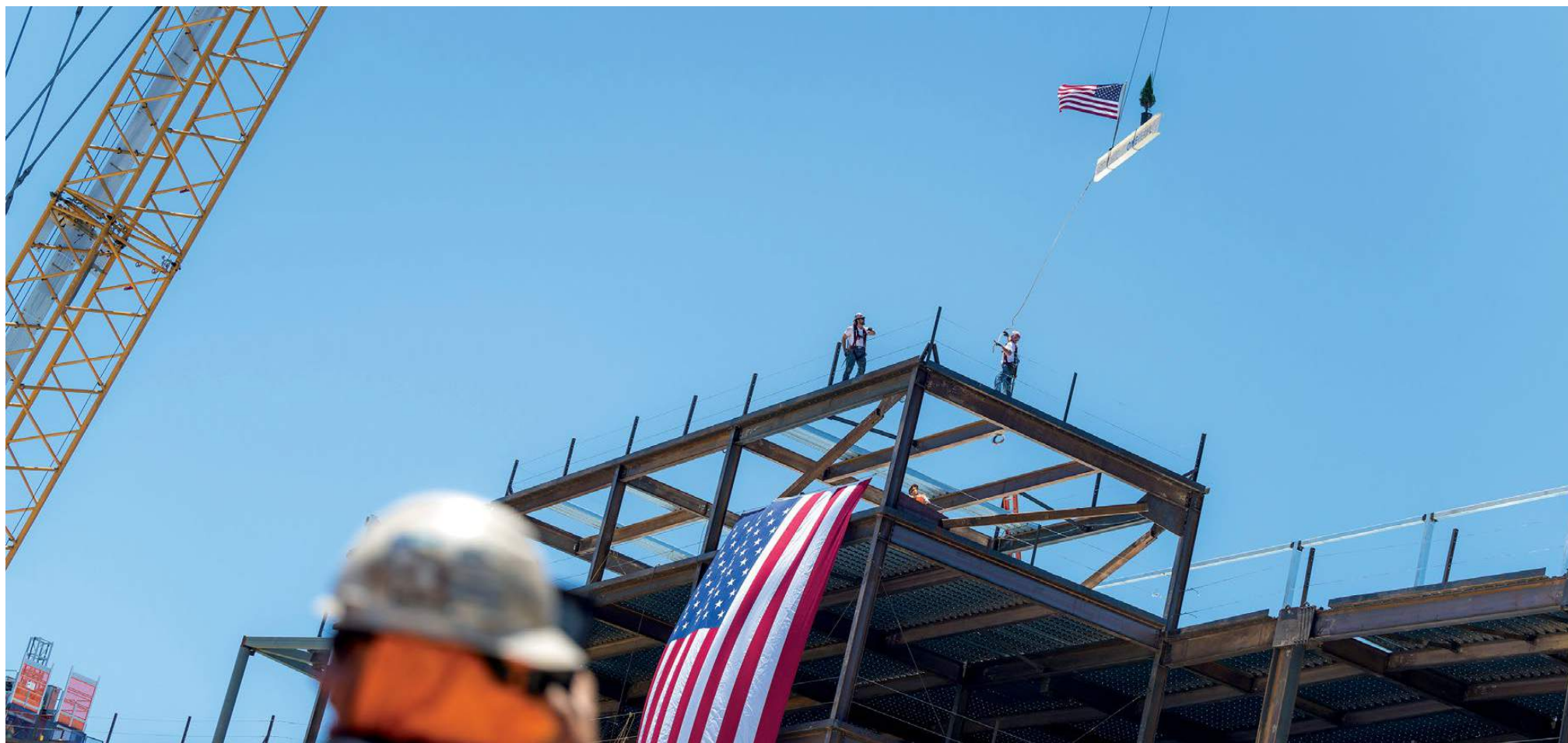
“Our dream is the realization of the impossible,” said Robert N. Weinreb, MD, director of the Shiley Eye Institute. “We are going to cure blinding eye diseases.”

**Topping Out**

A celebratory Topping Out ceremony at UC San Diego Medical Center in Hillcrest marked the approximate halfway point for the construction of a new outpatient pavilion — part of the first phase of a comprehensive revitalization project for the medical campus. The June event provided an opportunity for faculty, staff and construction workers to sign the last steel beam before it was raised 100 feet in the air and placed in the structural frame of the building, forever part of its lifespan.

“This historic milestone is a visible representation of not only the progress made but also the number of people involved in expanding access to the region’s No. 1 health care provider,” said Patty Maysent, CEO of UC San Diego Health. “The new outpatient pavilion greatly increases our capacity to serve our community and provide life-saving, novel and compassionate care to patients and their loved ones.”

The 250,000-square-foot outpatient pavilion is anticipated to open in 2025 and will house specialty clinical programs, including oncology, neurosurgery, urology, otolaryngology and orthopedics, as well as ambulatory surgery operating rooms, gastroenterology procedure rooms, advanced imaging, infusion and radiation oncology. The new space will also allow Moores Cancer Center at UC San Diego Health to greatly increase access to cancer care for patients throughout the region.



The first phase of construction for the overall project also includes a new parking structure to provide approximately 1,850 spaces for employees, patients and visitors, plus related road and utility infrastructure.

The project is part of the UC San Diego Long Range Development Plan, encompassing approximately 60 acres and the redevelopment of the more than 50-year-old Hillcrest campus. The \$3 billion revitalization project is expected to continue over approximately 15 years.

**Paving the Way**

A new Multidisciplinary Life Sciences Building will soon take shape in the Health Sciences West district, next to the Skaggs Pharmaceutical Sciences Building. The 180,000-square-foot laboratory facility will help meet the growing need for campus research space and also encourage collaboration between faculty in Health Sciences and the School of Biological Sciences. The facility will support researchers from a variety of life sciences fields, with an additional emphasis on neurobiology — one of the strongest scientific connections between the two programs.

The building will also house multiple classrooms, integrating the undergraduate student population into this region of campus. The plans include space for both wet lab and computational lab instruction to equip undergraduate students with the necessary skills to work in the modern life sciences industry.

“The Multidisciplinary Life Sciences Building is a unique project that exemplifies the collaborative and boundary-breaking spirit of UC San Diego,” said Vice Chancellor for Health Sciences John M. Carethers. “We’re excited to unite multiple programs and student populations through this multipurpose space and, through that unity, inspire a new wave of life sciences discoveries.”

Construction on the project is anticipated to begin in late 2024 and conclude in 2027. ●

↪ The celebratory **Topping Out ceremony** at UC San Diego Medical Center in Hillcrest provided an opportunity for faculty, staff and construction workers to sign the last steel beam before it was placed in the structural frame of the building.

# EXPANDING CARE TO SERVE THE COMMUNITY

UC San Diego Health is extending its network through partnerships with community hospitals.

BY MICHELLE BRUBAKER

AS PART OF ITS 10-YEAR VISION, UC San Diego Health, the region's only academic medical center, is taking a systematic approach to improving timely access to its services and care throughout our community.

Already underway, UC San Diego Health is revitalizing its medical center campus in Hillcrest, where a new outpatient pavilion is scheduled to open in 2025 (see page 23). The 250,000-square-foot facility will add more health services to the region and address the growing demand for specialized diagnostic, treatment and surgical services.

Simultaneously, the nationally ranked health care system is expanding its network of care to other areas in San Diego County.



## UC San Diego Health Welcomes Alvarado Hospital Medical Center *(pictured right)*

ON SEPTEMBER 20, 2023, the Regents of the University of California approved UC San Diego Health's request to purchase Alvarado Hospital Medical Center from Prime Healthcare.

Located at 6655 Alvarado Road, Alvarado Hospital Medical Center has served the College Area community for more than five decades. Its high-quality programs and services include a new

emergency department accredited for geriatric care, as well as comprehensive behavioral health, medical and surgical services.

"UC San Diego Health continues to grow its network of clinics and hospitals to better care for the community within new neighborhoods across the region," said **Patty Maysent**, CEO of UC San Diego Health. "UC San Diego Health looks forward to collaborating with the extraordinary

physicians, nurses and staff at Alvarado Hospital and inviting them to be part of our team."

UC San Diego Health will work with all regulatory partners to ensure a smooth continuation of care and will further develop clinical services in collaboration with Alvarado Hospital medical staff. There will be an early focus on behavioral health services and the behavioral health

patient care tower. Planning for expanded psychiatric services will occur in collaboration with San Diego County.

"Academic and community health systems across the United States are experiencing incredible transformation as they combine forces to create stronger and more reliable networks of care. This is a unique opportunity to create a more robust community-oriented health care model while expanding access to the highest quality of care," said **Pradeep K. Khosla**, chancellor of UC San Diego.

"UC San Diego Health continues to grow its network of clinics and hospitals to better care for the community within new neighborhoods across the region."

**Patty Maysent**,  
CEO of UC San Diego Health

## Tri-City to Partner with UC San Diego Health *(pictured below)*

IN LATE OCTOBER, 2023, after open public discussion and a unanimous board vote, Tri-City Healthcare District announced that UC San Diego Health has been selected as the District's future health care partner.

A Joint Powers Agreement will now be co-developed that allows UC San Diego Health to provide administrative, clinical and operational management for all health care services with direct input and guidance from a diverse community board.

Under the future agreement, UC San Diego Health will partner with Tri-City's Board, medical staff, employees and the community to offer the region affordable, accessible and high-quality health care services across the full range

of specialties, including services for pregnancy and gynecology, cancer, cardiovascular, neurosurgical, behavioral health and other needs.

"UC San Diego Health strives to improve timely and equitable access to safe and high-quality health care. Through an approach of welcoming existing facilities into the UC San Diego Health network, in tandem with the construction of new facilities, we will be able to more rapidly deliver the unique combination of medical and surgical services that defines us," said **John M. Carethers, MD**, vice chancellor for Health Sciences at UC San Diego. ●



↑ UC San Diego Health expands its care through the acquisition of Alvarado Hospital Medical Center.

→ UC San Diego Health reaches patients in North San Diego County through its partnership with Tri-City.

*Photos courtesy of Tri-City Healthcare District and Prime Healthcare.*

# SHAPING THE FUTURE OF DIGITAL HEALTH

UC San Diego Health's artificial intelligence-powered predictive health care solutions are advancing patient care.

BY ANNIE PIERCE



**IMAGINE A HOSPITAL-BASED MISSION CONTROL** center fueled by artificial intelligence that can monitor patient health, predict patient flow and identify and diagnose treatment options in real time.

That's the vision of the Joan & Irwin Jacobs Center for Health Innovation (CHI), which is already using technology to bridge the divide between health care and the human experience.

Launched in 2021 and recently infused with a generous \$22 million in gifts from Joan and Irwin Jacobs in 2023, the CHI is leveraging the power of AI and human-centered technology to drive advancements in patient care.

The Jacobs' gifts will make the development of the new mission control center a reality within the next three to five years. It will reside in Jacobs Medical Center, the 10-story, 245-bed academic medical center in La Jolla, which the Jacobs generously donated \$100 million to build.

"We are at a pivotal point with AI, not just in health care but in society as a whole," said **Christopher Longhurst, MD**, executive director of CHI and system chief medical officer at UC San Diego Health. "We are developing new tools that are transforming our ability to use data to drive better patient care decisions and create better operational workflows."

"And this is just the tip of the iceberg," Longhurst said, adding that in the next five to 10 years, he expects to see a health care revolution, with the emergence of generative AI and the implementation of digital health innovations.

Of the AI tools UC San Diego Health is currently testing, Longhurst said several stand out for their potential impact on clinicians, including:



**Christopher Longhurst, MD**



**Albert Hsiao, MD, PhD**

## INVESTMENT IN THE FUTURE OF HEALTH CARE

### \$22M

gifted by Joan and Irwin Jacobs in 2023 to create a mission control center powered by AI.

### 3-5 Yrs

timeline for the new AI mission control center to be developed after the Jacobs' \$22 million donation.

### 2,500

chronic disease patients remotely monitored by UC San Diego Health to help reduce ER visits.

- Working with Amazon Web Services, Open AI and other partners to create a secure, HIPAA-complaint generative AI environment.
- Piloting generative AI in patient messaging with electronic health record vendor Epic Systems to help manage incoming messages to providers in ambulatory areas.
- Testing physician network Doximity's DocsGPT platform to support clinicians with writing insurance letters, denial rebuttals and chronic condition referrals.

"While we must proceed cautiously, we find ourselves on the precipice of a groundbreaking era," Longhurst said.

The Jacobs Center for Health Innovation is modeled after the University Health Network's Techna Institute, located within the organization's hospital sites and at the University of Toronto. Similar innovation centers are housed at UC San Francisco, Washington University, Cleveland Clinic, Mayo Clinic and New York University.

## Inaugural Chief Health AI Officer Joins UC San Diego Health



**Karandeep Singh, MD**, has been recruited as the Joan and Irwin Jacobs Endowed Chair in Digital Health

Innovation and named as the inaugural chief health artificial intelligence (AI) officer at UC San Diego Health, a newly developed position for the region's only academic hospital system.

In this role, Singh will focus on implementing change that advances safety and health outcomes in acute and ambulatory settings. His contributions will be pivotal in bringing leading-edge technology to the bedside, connecting the science and discovery that arise from academic and industry partners.

He will lead organizational approaches that integrate AI into clinical workflows, reduce documentation time, improve efficiencies and patient experience, while ensuring the appropriate structure and governance are in place for successful, accountable AI deployment in health care.

"I'm eager to work with UC San Diego Health's leadership to expand our shared goals of making care better, faster and more accessible," said Singh. "UC San Diego Health's commitment to excellence in clinical care, research and innovation gives us the opportunity to dream big and rethink how health care should be delivered in the AI era."

Singh's commitment to discovering new ways for technology to positively serve the community aligns with UC San Diego Health's leading efforts to champion AI and integrate the power of advanced technology in health care.

Singh adds that his focus will also include driving modernization beyond the hospital walls and expanding the health system's reach to entire communities and industries, stretching as far as the national level.

→ **The Joan & Irwin Jacobs Center for Health Innovation** is pioneering new digital health solutions at UC San Diego Health.

“We believe the Center for Health Innovation at UC San Diego Health will lead the development of new ideas and digital tools that measurably improve health quality and patient care for a broad population, creating a model for other hospitals nationally,” said **Irwin Jacobs**, co-founder, founding chairman and CEO Emeritus of Qualcomm and a founding faculty member of UC San Diego, serving as a professor of electrical and computer engineering from 1966 to 1972.

The digital health hub will monitor patient health and safety through the integration of data streams from cameras, sensors, electronic health records, bedside monitors, imaging, wearable tracking devices and other sources. The goal is to develop AI algorithms and models that proactively improve personalized treatment, health equity and patient experience.

Since the Center for Health Innovation’s launch in 2021, a novel, multi-modal AI-based sepsis prediction algorithm for UC San Diego Health inpatients now pinpoints patients who are at the greatest risk for developing the deadly infection that can cause organ failure. Remote tele-monitoring of 2,500 patients with chronic diseases helps keep them at home and out of the emergency department. And radiologists are now using AI to detect abnormalities by finding patterns in thousands of scans that algorithms can sift through in mere minutes.

**Albert Hsiao, MD, PhD**, professor of radiology at UC San Diego School of Medicine and radiologist at UC San Diego Health, said that the AI algorithms he and his team have implemented to scan, interpret and analyze imaging have catapulted their efficiency. “What used to take an hour now takes about 10 minutes,” he said.

“Leveraging this technology to do things more efficiently helps us diagnose conditions that we couldn’t diagnose before,” Hsiao said. “It’s another step in the evolution of technology, using AI to change the way we are able to refine our craft.” ●



ON THE AI HORIZON:

## Virtual Physician Assistance



The COVID-19 pandemic sparked unprecedented use of virtual medical visits and digital communications

between patients and doctors that have remained in high demand. Portals such as MyChart make it simple to email a doctor and have created a heightened demand for provider responses that many can no longer efficiently handle.

UC San Diego Health is one of the first health systems in the country to participate in a pilot program with electronic health record vendor Epic Systems. The program aims to test the use of generative AI chatbots to draft patient responses to non-emergency questions, helping to alleviate physician burnout in the process.

And it’s working. The pilot program, currently being tested by a select group of UC San Diego physicians, uses generative AI that is integrated into the patient portal and electronic health record to draft empathetic and detailed responses. For full transparency, the messages include a notification to patients that they have been automatically generated by AI before being reviewed and edited by the physician who signs them.

“Incoming messages to providers in ambulatory areas doubled during the pandemic, and it’s leveling off at a much higher rate than pre-pandemic,” said **Marlene Millen, MD**, chief medical information officer for ambulatory care at UC San Diego Health, during a recent GenAI Town Hall event at UC San Diego Health. “One of the things about AI is that it doesn’t get tired, so even at the end of a long day, it can still have an empathetic tone while synthesizing clinical notes and data into the response.”

In addition, a recent UC San Diego Health study concluded that evaluators preferred chatbot responses to physician responses 79% of the time, because chatbots can generate lengthy responses within seconds, while a time-crunched doctor may only have time for a short, facts-only response.

“Doctors are getting dozens and sometimes hundreds of messages each day,” said Longhurst, one of the study’s authors. “Can our doctors provide high-quality, empathetic responses to messages? Absolutely. But the challenge is time.”

Generative AI is penning longer responses than physicians would typically send, which is helping to reduce unnecessary appointments, according to Longhurst. Previously, a physician may have decided to set up a virtual call to discuss a patient’s question instead of taking the time to type out the answer. Now, generative AI’s thorough and editable responses give physicians a sense of comfort that they’ve provided all the necessary information.

“While celebrating these advancements, we must remember that generative AI does not replace human expertise and compassion. Instead, it is a collaborative tool that amplifies our capabilities and guides us toward better patient care and a more highly reliable learning health system,” said Longhurst of all patient-centered current and future technology developed at UC San Diego Health’s Center for Health Innovation.

“The fusion of human intelligence and generative AI has the potential to pave the way for a brighter future in medicine. Our goal is to be a leader in digital health tools that can improve the delivery of health care across the continuum.”



# Cancer Treatment *of* Tomorrow, Today.

BY MICHELLE BRUBAKER

**Around six years ago, I sat anxiously in a doctor's office at UC San Diego Health. I had been diagnosed with breast cancer at age 39 with two young kids. This was not part of my life plan, but I have learned that cancer does not discriminate or care about plans.**

It was my first visit with my medical oncologist. While the team was amazing, I felt completely overwhelmed. It was a lot of information to process. After learning I qualified for a clinical trial, it did not take me long to decide I wanted to enroll. Having access to trials and novel treatments was the reason I chose to receive my care at our region's only academic medical center. I wanted to do whatever it took to see my kids grow up.

The clinical trials coordinator assigned to my case became an integral extended family member. He not only explained the trial in terms I understood, he also answered every question and listened to and supported me during my darkest days.

My breast cancer had spread to my lymph nodes. Nearly three weeks after being on the clinical trial drug, my enlarged lymph node was a normal size and my tumor was two-thirds smaller. I had what I desperately yearned for when this ugly disease disrupted my life — hope of survival.



Receiving the fifth out of 10 chemo treatments for breast cancer.

ACCORDING TO THE AMERICAN CANCER SOCIETY, approximately 2 million people will be diagnosed with cancer in the United States this year, with half of all men and a third of all women diagnosed during their lifetime.

Each will face life-saving decisions about treatment, combined with a broad range of emotions. Cancer requires treating the whole person, not just the disease.

Studies have shown that receiving treatment at a top-ranked academic center improves survival rates.

As a National Cancer Institute (NCI)-designated Comprehensive Cancer Center, Moores Cancer Center at UC San Diego Health holds the highest possible rating for a cancer center in the nation. This designation is reserved for centers with experts in every medical subspecialty

who are pushing boundaries to improve approaches for preventing, diagnosing and treating cancers.

The cancer center unites research laboratories, clinical trials, prevention and outreach programs and clinical care. The focus is on the discovery and testing of new therapies, as well as a strong emphasis on translational oncology, drug development, community outreach, rehabilitation services and support and counseling services for patients and their loved ones.

“With more than \$73 million in annual research grants and national experts in cancer care, Moores Cancer Center is not only an asset to the university, it’s an asset to our community,” said **John Carethers, MD**, vice chancellor for Health Sciences at UC San Diego.

In the 2023–2024 *U.S. News & World Report* “Best Hospitals” survey, cancer services at UC San Diego Health ranked No. 20 in the nation.

“We have the brightest scientists shifting the paradigm of cancer treatment. Discoveries made in the laboratory are then applied directly to patient care,” said **Joseph Califano III, MD**, director of Moores Cancer Center, director of the Hanna and Mark Gleiberman Head and Neck Cancer and otolaryngologist (head and neck surgeon) at UC San Diego Health.

“With San Diego being a hub for biotech companies, we are able to more closely and directly collaborate right in our backyard for an expedited approach to developing new therapies,” adds Califano.

Approximately 25,000 patients are treated for cancer at UC San Diego Health annually. Patients have access to physicians who provide personalized care and are setting treatment standards nationwide for more than 200 types of cancer. Patients also have access to clinical trials, with a dedicated team that supports more than 250 open research studies.

“Our outstanding teams have an unwavering focus on delivering lifesaving, highly specialized cancer care and groundbreaking research to the community,” said **Patty Maysent**, CEO of UC San Diego Health. “We are deeply proud of our cancer center and the care and compassion we provide for our patients, who are parents, family members, friends, neighbors, colleagues and caregivers.”



Moores Cancer Center



Moores Cancer Center Lobby



Radiation therapist at work.

“Moores Cancer Center is not only an asset to the university, it’s an asset to our community.”

**John Carethers, MD**, vice chancellor for Health Sciences at UC San Diego

“He had many additional years of making memories with his family, given the personalized care he received at UC San Diego Health,” said McKay. “We cannot cure every patient, but we work tirelessly to advance the science and treatments. We are always looking for the best option for remission and a quality of life for our patients.”

Moores Cancer Center at UC San Diego Health also uses a leading-edge Molecular Tumor Board. It includes expert physicians, world-class scientists, medical oncologists, surgeons, radiation therapists, geneticists and pathologists. The team meets to discuss and advise on the best treatment plans for specific cancer patients whose tumors have been analyzed with advanced genomic diagnostic tests.

Treatment options may include chemotherapy, radiation, surgery, blood and bone marrow transplant, cryotherapy, hormone therapy, heated intraperitoneal chemoperfusion, precision medicine, photodynamic therapy and/or clinical trials participation. A patient’s care plan may include one or a combination of these treatments.

The Molecular Tumor Board, working with the Center for Personalized Cancer Therapy, enables medical teams to translate science in real time into treatment recommendations for patients.

“Four walls do not make a unique cancer center. It’s when a patient walks through our doors and knows they have access to a comprehensive team with an understanding of their specific cancer, as well as a commitment to personalized therapy, including clinical trials — that is the secret sauce,” said **Ramez Eskander, MD**, director of the Clinical Trials Office at UC San Diego Moores Cancer Center and professor in the Department of Obstetrics, Gynecology, and Reproductive Sciences at UC San Diego School of Medicine.

Eskander, also a gynecologic oncologist at UC San Diego Health, was initially interested in orthopedic surgery as a medical student but soon gravitated toward the complexities and science

**Moores Cancer Center** at UC San Diego Health is San Diego’s only NCI-designated Comprehensive Cancer Center and is repeatedly ranked #1 in San Diego for cancer care by *U.S. News & World Report*.

Rana McKay, MD



### The Secret Sauce

“There are many exciting diagnostic tests, biomarker assays and therapeutic treatments being developed in the cancer world,” said **Rana McKay, MD**, interim associate director of clinical sciences and associate professor in the Department of Medicine at UC San Diego School of Medicine. “Our patients have access to the potential treatments of tomorrow, today.”

Immunotherapy is an area of cancer research that has continued to show tremendous promise by harnessing the body’s own immune system to treat cancer. It has been proven to be transformative in the treatment of Hodgkin lymphoma and cancers of the lungs, bladder,

kidney, skin, prostate, colon, cervix, uterus, head and neck.

Physicians are examining alternate treatment strategies to further improve outcomes while reducing treatment-related side effects, including monoclonal antibodies and antibody-drug conjugates, which are like a precision-guided “biological missile” with the ability to destroy cancer cells accurately and prevent damage to healthy cells.

These novel therapies are sometimes developed in concordance with biological indicators, called biomarkers, to inform treatment efficacy or response.

“Cancer is not one size fits all. No two cancers are alike, just as no two people

are alike. Our teams are fueled by the motivation to continually understand disease states and treatment options,” said McKay, genitourinary medical oncologist at UC San Diego Health.

“What sets us apart in the region is that we design the research studies and bring the treatments directly to our patients. Integrating clinical trials into a patient’s treatment plan is critical to providing comprehensive care that has the greatest potential to positively impact long-term outcomes for patients.”

McKay added that a recent patient with prostate cancer was able to live a quality life for a decade longer after receiving 13 lines of therapy in multiple trials.



Our team is the first organization in the country to be recognized as a Center of Excellence in medication-use safety and pharmacy practice by the American Society of Health-System Pharmacists. This reflects our high-performing pharmacy department's commitment to superior patient care.



Researchers developing the next cancer therapy.



Ramez Eskander, MD

“The advances that have been made over the last decade in the treatment of gynecologic cancers are transformative and a testament to the work being done at UC San Diego Health.”

Ramin Eskander, MD, director of the Clinical Trials Office at UC San Diego Moores Cancer Center and professor in the Department of Obstetrics, Gynecology, and Reproductive Sciences at UC San Diego School of Medicine.

behind cancer care as he approached his clinical years.

“I had the opportunity to care for patients with aggressive gynecologic cancers, observing the impact of multi-disciplinary, complex care and state-of-the-art treatment. I immediately knew that was my passion, and I pursued a career in gynecologic oncology. It is an honor to build relationships with our patients from the moment of diagnosis and throughout their entire therapeutic journey,” said Eskander.

“I am incredibly passionate about what we are doing at Moores Cancer Center. Cancer has become a dynamic and rapidly evolving field. We have progressed from grouping cancers together based on the organ of origin to being much more thoughtful about the molecular drivers that inform treatment. The advances that have been made over the last decade in the treatment of gynecologic cancers are transformative and a testament to the work being done at UC San Diego Health.”

Kathryn Gold, MD, professor of medicine in the Department of Medicine at UC San Diego School of Medicine and interim chief of the division of hematology and oncology, said cancer care and clinical trials have significantly advanced in her 15-year career, especially with targeted therapy and immunotherapy.

She added that clinical trials were once viewed as a last effort if standard treatment was not effective. Today, newer, more personalized therapies have revolutionized the way medical teams approach cancer treatment.

“We sometimes use trial drugs as first-line therapy. For some patients, a single drug may be successful; in others, we may need to add an additional therapy or try a different one,” said Gold, a lung and head and neck medical oncologist at UC San Diego Health.

“For example, lung cancer isn’t just a single disease. Every lung cancer is different, and treatment works best when it is personalized. You can think of lung cancer as comprising 25 different diseases, each with 25 possible treatment options. We now have a larger tool kit to target the specific disease for that individual.”

### Bright Futures Ahead

Moores Cancer Center at UC San Diego Health has a remarkable legacy in San Diego and nationwide.

With the growth and volume of patients coming to UC San Diego Health for cancer care, there is an institutional commitment and investment for the community, according to McKay.

The Clinical Trials Office is redesigning its infrastructure and clinical trials operations to offer more trials to more patients, including underrepresented patients.

“Woven into the fabric of our culture of care is our diverse patient population, as well as ensuring all patients have access to treatments and clinical trials. Health care equity is a central part of our mission. There are multiple factors in caring for our diverse patient populations, from our diverse staff to our operations,” said McKay.

“Our patients want to be seen and heard and relate to those who are providing their care during a vulnerable time.”

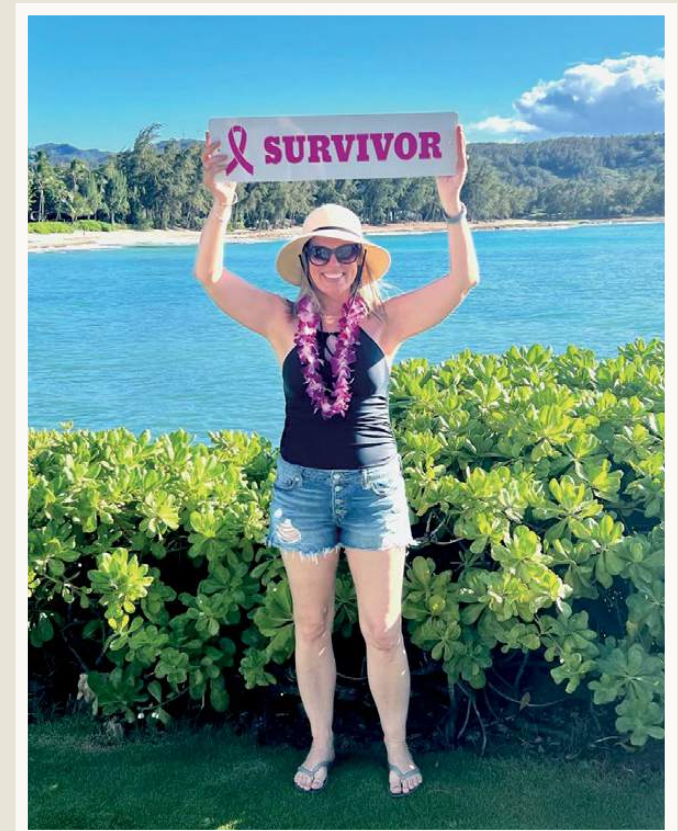
UC San Diego Health continues to expand and improve access to patients

with cancer care locations throughout San Diego County. As part of its 10-year vision, the health system is in the process of revitalizing its medical center campus in Hillcrest, where a new outpatient pavilion is scheduled to open in 2025 (see page 20). It will offer a variety of services, including advanced imaging, infusion and radiation oncology.

Other exciting efforts include the launch of translational working groups through the Moores Cancer Center Office of Translational Science to expand impactful translational research across the institution, as well as a cancer retreat where scientific investigators around the nation come together to discuss and deliver scientific discoveries for patients.

“The cancer center has a brilliant future ahead,” said McKay.

After nearly two years of treatment, with an incredible multi-disciplinary team by my side and participation in two clinical trials, I am going on six years breast-cancer free. For me, the future is also bright. ●



Six years breast-cancer free.

# Welcome to the COAST Curriculum

An essay by Michelle Daniel, MD, Vice Dean for Medical Education.

EDUCATION AT THE UC SAN DIEGO SCHOOL OF Medicine is undergoing an exciting transformation. In the fall of 2023, we launched a brand new medical student curriculum that embodies our newly defined vision, mission and core values. We are growing our medical education programs to help create the workforce needed by the state of California, and this year, we will admit our most diverse class to date.

Our new vision — *training for tomorrow, rooted in science and justice, delivered with heart* — emphasizes our future orientation, our grounding in science, and our commitment to delivering equitable care with empathy and compassion for all.

Our new mission — *to educate and inspire physicians to provide innovative, compassionate and equitable care to advance the health of patients, families and communities* — highlights the type of care our graduates can be expected to provide, as we shift our focus from treating disease to promoting health in a manner that is creative, human-centered and kind.

Our core values — *compassionate, equitable and just, scientifically informed, collaborative, person-centered, creative and innovative* — underscore the qualities we aim to cultivate in our learners, as they develop into the doctors of tomorrow.”

These ideals are embodied within our new **COAST** curriculum, where Caring, Original Advocates Share and Thrive.

## Caring

In our new curriculum, one of our flagship courses is **CARE** (Compassionate Action and Real Engagement). This course is being offered in partnership with the Sanford Institute of Empathy and Compassion. In CARE, students are introduced to a curriculum of compassion, one that emphasizes both self-compassion and personal well-being, as well as compassion and empathy for patients, families and communities. They are engaged in ambulatory medicine by dedicated faculty who work with marginalized populations, where social determinants of health have significant impacts on health outcomes. Students also engage in service learning and outreach through community partners.

## The 2023 Incoming Class: By the Numbers

# 25

### UC San Diego Alumni

#### STRONG CALIFORNIA FOCUS

**78%** residents of California

**66%** earned their degrees in California

## Original

In the new curriculum, medical school is a bit more personal. Students get to select an area of focus to help them “stand out” to future residency programs. Just like undergraduates get to differentiate by selecting a “minor,” medical students can now select from one of five concentrations: 1) Compassion in Care, for students who see themselves as person-centered frontline care providers, 2) Equity and Advocacy, for students who see themselves as champions of equity and justice, who aim to influence health policy, 3) Exploration and Entrepreneurship, for students who see themselves as scientists, inventors, innovators or entrepreneurs, 4) Teaching and Learning, for students who see themselves as future medical educators, training the next generation of physicians, or 5) Building Better Systems, for students who see themselves as system developers and leaders. Students will select electives in their concentration area to build knowledge and skills, and the experience will culminate in an original capstone project.

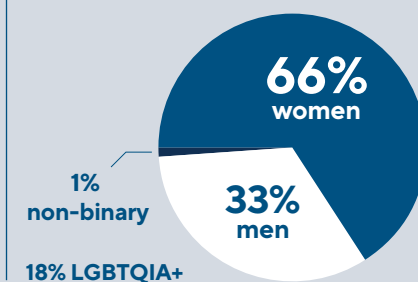
Through these concentrations, we aim to leverage the strengths of the broader UC San Diego campus (e.g., in public health, business, engineering, education and computer science) to expand our students’ understanding of the intersections between medicine and related disciplines.

#### MOST DIVERSE CLASS YET

**33%** underrepresented minorities in medicine

**84%** involved in DEI initiatives

**18%** first-generation college students



**18% LGBTQIA+**



← Michelle Daniel, MD, is a board-certified emergency medicine physician at UC San Diego Health.

## Thrive

This year we implemented a new life coaching program to ensure our learners thrive in medical school. The program will help students realize their personal mission and vision, develop a growth mindset, mitigate burnout and achieve professional fulfillment. This program will complement our Master Clinician Program, where expert clinicians provide directed feedback to learners at the bedside, focused on clinical skill development, and our Academic Community Directors, who provide academic and social support as students navigate medical school and develop their professional identities.

In addition to our new curriculum, we are expanding our **PRIME** (Program In Medical Education) Health Equity and Transforming Indigenous Doctor Education programs. In these programs, students complete an MD and a Master’s degree over five years. The majority (65%) complete a Master’s in Public Health. The alumni of these programs have an excellent track record of working in California (65%), specializing in primary care (76%) and practicing in underserved areas (73%).

During this past year’s admission cycle, we received 8,757 applications, conducted 900 virtual interviews and matriculated 141 medical students (1.6% of applicants). The entering Class of 2023 is comprised of 66% women, 33% men and 1% non-binary. Eighteen percent are first-generation college students and 33% are underrepresented in medicine. Seventy-eight percent are California residents and 25 are UC San Diego alumni. The three most common majors in our matriculants are biology, biochemistry and neuroscience. Many have demonstrated commitments to advancing equity, diversity and inclusion, service, education or leadership.

In sum, this is an exciting time of transformation at the medical school and an exhilarating time to join the field of medicine. ●

## Advocates

In the new curriculum, we will continue our long history of emphasis on scientific principles, while embracing new and improved content through another flagship course: **ESS** (Equity and Systems Science). This course features a case-based curriculum that helps learners advocate for optimal patient outcomes through an enhanced understanding of complex systems, health disparities, high-value care, public health, health policy, health economics, artificial intelligence and informatics.

## Share

Our medical curriculum is the foundation upon which our students and their future training partners in Graduate Medical Education will build their careers. Our new **CLEAR** (Comprehensive, Longitudinal, and Equitable Assessment and Reporting) Committee allows us to aggregate information from every sphere of our students’ training and assess their performance in our core competencies. Students can trust that they are evaluated by a collaborative group of diverse faculty members who represent not only their own personal identities but also the range of professional pathways of future training. These assessments are shared with students, enabling richer, more personalized development and future residencies, facilitating the transition to the next stage of training.

# ADDRESSING THE DIVERSITY GAP IN HEALTH CARE

According to experts, there is a disparity between the diversity of health care staff and the patients served. UC San Diego Health is seeking to change that to ensure all patients can feel seen, heard and supported.

BY JEANNA VAZQUEZ

CHRISTOPHER VELA WAS SITTING BESIDE HIS grandfather's hospital bed when he decided to become a nurse. His beloved grandfather had been diagnosed with terminal cancer, and at the time he was receiving hospice and palliative care.

"It was in that moment, sitting in my grandpa's intensive care unit room, that I knew what I was meant to do with my life," said Vela.

Vela's grandfather sadly passed away a few days later, but the impact of that moment and those times left an indelible mark.

"Even now, I think about those nurses and what they did for my grandpa and our family, and I've wanted to do the same for others," Vela said. "I want to help people going through some of the toughest moments in their lives and be there for them."

After graduating high school in South Bay San Diego, Vela became the first

person in his family to go to college. However, as a first-generation Mexican-American citizen and the sole financial provider for his family, nursing school seemed a distant goal.

"I first started the associate degree nursing (ADN) program at Southwestern College in 2015. During that time, I was also working two different jobs to help provide for my grandma and family," he said. "Unfortunately, due to personal circumstances, I had to drop out of school to work."

"I thought my dream of becoming a nurse was over, but I wasn't ready to give up."

Years later, Vela reapplied to the nursing program.

He graduated from Southwestern College with his ADN in 2022 and completed exams to become a Registered Nurse that same year.

➤ **Christopher Vela** overcame personal and financial challenges to achieve his dream of becoming a nurse. After pausing his nursing education to work and provide for his family, Vela persevered and graduated from the Southwestern College nursing program in 2022. That same year, he passed his exams to become a registered nurse.



### Not Giving Up on His Dream

As part of his training, Vela applied to be part of UC San Diego Health's D.R.E.A.M. Nurse Externship Program, which provides participants with career guidance and critical skills to support their transition to becoming a professional clinical nurse.

D.R.E.A.M. stands for Diversity, Retention, Equality, Aspire, Mentor.

One key goal of the program is to create and sustain a more inclusive nursing workforce to care for UC San Diego Health's diverse patient population. This is accomplished through collaboration between the academic institution and local community colleges in San Diego, including Southwestern College, City College and Grossmont College.

"There is a disparity between the diversity of our nursing staff and the patients we serve," said Cabiria "Bea" Lizarraga, nurse manager at UC San Diego Health. "To address this, we created a program that aimed to increase diversity within our team, as well as address opportunity gaps among nursing students currently underrepresented in the field."

Lizarraga created the program with fellow UC San Diego Health nurse leader **Gwendolyn McPherson, MSN, RN**, in 2021.

According to Lizarraga, there is a lack of diversity in nursing, noting that the majority of Hispanic and African American registered nurses obtain their ADN as their initial nursing education, which can be a barrier to entering the profession, as many health care institutions prefer a Bachelor of Science in Nursing degree.

"Through this program, we've created a pathway for ADN students to join our institution, while partnering with them through mentorship to address any barriers and optimize each student's success," said Lizarraga.

Since its inception, they've hired 18 new grad nurses at UC San Diego Health from the D.R.E.A.M. program.

### Supporting Underrepresented Youth

In addition to partnering with community colleges in the region, UC San Diego Health has also launched a program that seeks to encourage high school students in underrepresented communities to pursue health care careers. The UC San Diego Health

**"There is a disparity between the diversity of our nursing staff and the patients we serve... we created a program that aimed to increase diversity within our team, as well as address opportunity gaps among nursing students currently underrepresented in the field."**

**Cabiria Lizarraga, nurse manager at UC San Diego Health**

Career Experience will offer exposure and experience with health career professions to high school students to stimulate interest toward pursuing careers in fields such as primary care, nursing and allied health professions. Students learn about health care roles, including medical assistants, physical therapy assistants, radiologic technicians and certified nurse assistants.

UC San Diego Health received \$2.2 million in grant funding from the California Department of Health Care Access and Information (HCAI) to develop the program in December 2022.

The grant awards are issued through HCAI's Health Professions Pathways Program, which focuses on students interested in entering fields of primary care, behavioral health, geriatrics, nursing and oral and allied health.

In total, \$40.8 million grant funds were awarded to 20 health care organizations from across the country, and UC San Diego Health is the only health care institution in the region to be awarded funds, which will be distributed over the next five years.

Approximately 240 students will take part in the program each year and will be coached on their health care profession of interest. Additional lessons cover relationship-based care, personal branding, health literacy and health care disparities, health care technology, cultural competence, professional communication and research and evidence-based practice.

"This program provides us with the opportunity to connect with high school students and offer comprehensive

academic enrichment, career development and mentorship," said **Gerard Phillips, DNP, MBA, RN**, senior director of nursing at UC San Diego Health. "We're thrilled to be using this funding to help with efforts that will result in a more diverse and inclusive workforce."

Studying under the direct supervision of a health care provider, students involved in the program will observe and participate in a variety of clinical experiences. Patient care areas that students will gain exposure to include behavioral health, geriatric health, primary care and general adult medical-surgical care.

Additionally, UC San Diego Health experts will speak at local high schools.

Since receiving the grant, the team has hired a program coordinator who is developing curricula, training materials, coordination with local schools and more.

The first cohort of high school students is expected to begin their training at UC San Diego Health in early 2024.

### Reducing Health Disparities

According to Vela, programs like the D.R.E.A.M. Externship provided him with valuable, real-world work experience that he couldn't find elsewhere.

The UC San Diego Health Career Experience seeks to shape students' perspectives and provide them with connections that allow them to imagine a future for themselves as health professionals.

"This has been such an incredible opportunity for associate degree nursing

students like myself, who might come from troubled upbringings, or have emigrated from another country or who couldn't devote their lives to nursing right away but bring valuable life experiences that patients can relate to," Vela said. "For the patients we treat, it's like we're taking care of family, because we've been through so much of the same."

Both programs are associated with UC San Diego Health's overall mission to achieve health equity by reducing the health disparities that are often

↳ Christopher Vela's mentor, **Tania Miller** (right), an RN at UC San Diego Health, created a safe space for him to learn and practice in the field of medicine while he trained in the Intensive Care Unit at UC San Diego Medical Center in Hillcrest.

experienced by individuals from underrepresented communities, which is driven by structural and institutional racism.

"We are committed to ensuring that UC San Diego Health is a place where all can thrive," said **Patty Maysent**, CEO, UC San Diego Health. "The D.R.E.A.M. Externship and UC San Diego Health Career Experience are a direct reflection of our desire to proactively create a diverse workforce and to invite young minds into promising careers in academic medicine."

"These programs are helping foster a vibrant and welcoming health care environment that reflects our patients, providers and local community overall."

The Principles of Health Equity at

UC San Diego Health aim to reduce, and ultimately eliminate, health disparities in the community and their root causes, including social determinants of health.

The goal of these programs is to empower students to be future leaders in health care, including students like Vela.

Vela, now working as a clinical nurse at UC San Diego Medical Center in Hillcrest, could not help but think back to the day that he sat in his grandfather's hospital room.

"My grandfather's nurses treated him with dignity and cared for him as if he was their own family," Vela said. "They supported us and soothed our pain during our grief. It's such an honor that I now get to provide that same level of support and care for others in need." ●





# A Nontraditional Doctorate

A new doctoral program aims to improve the real-world implementation of public health discoveries.

Written by Yadira Galindo



AFTER EARNING A BACHELOR OF ARTS IN NEUROSCIENCE from Wellesley College, **Lilian Perez** took a gap year to prepare for the Medical College Admission Test (MCAT) and apply to medical school. She was working for a health advocacy organization, and later another focused on empowering women in science, when she received what she considered disappointing MCAT scores.

Still considering a path to medical school, Perez sought guidance from a student counselor at her alma mater. The counselor considered Perez's choice of jobs during her sabbatical and suggested that Perez consider a Master of Public Health (MPH).

"I had not heard of public health. It wasn't a major at my college," said Perez. "It really intrigued me. I hadn't realized that I was applying public health principles throughout my undergraduate career. It was something I was very passionate about, but it hadn't clicked in my mind that it was a career option or that there was a whole field dedicated to prevention."

After earning her MPH from Emory University, Perez found herself working at the Centers for Disease Control and Prevention alongside **Michael Pratt, MD, MPH**, who introduced her to the field of physical activity and public health.

Perez was hooked.



Graduate students at Herbert Wertheim School of Public Health and Human Longevity Science learn to translate lessons from the classroom and lab into tangible public health programming.



### Postgraduate Education

Pratt encouraged Perez, a first-generation college student, to apply to public health doctoral programs with strong research portfolios in physical activity and epidemiology.

Pratt himself relocated to UC San Diego where he currently serves as a professor at the Herbert Wertheim School of Public Health and Human Longevity Science, as well as director of the MPH program.

The opportunity to learn from experts in the field of physical activity, whose research she had already been following with interest, led Perez to select the UC San Diego–San Diego State University Joint Doctoral Program (JDP) in Public Health.

“Being able to work with experts in this field and follow in their footsteps attracted me to the program. In addition, the flexibility of getting applied hands-on experience was really important for me to grasp the skills that I need for intervention, research and epidemiological research,” said Perez, who graduated from the JDP global health track in 2017 and now works for the RAND Corporation as a policy researcher.

UC San Diego is uniquely positioned to apply principles from a wide range of disciplines — from medicine and

pharmaceutical sciences to engineering, business and oceanography — in the pursuit of novel solutions for 21st century public health challenges, as the university is also dedicated to cultivating the next generation of diverse public health professionals and leaders through innovative and transformational education programs.

“We want people to think about public health issues across different disciplines as a means to leverage their skills to help us advance intersecting problems,” said **David Strong, PhD**, professor and JDP director.

“The doctoral program fosters innovation in a way that would not otherwise exist. It gives us the power to think about what could be next and then find the person who can take on the challenge.”

For example, **Giovanni Appolon, MPH**, a current JDP student in the epidemiology track, collaborated with faculty in the UC San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences to evaluate the association between historic redlining and spatial access to pharmacies.

**Anaïs Teyton, MPH**, a JDP student in the Climate Change Epidemiology Lab at UC San Diego Scripps Institution of Oceanography, was the first author on a research paper that assessed the association

between air pollution exposure and emergency department visits during an infant’s first year of life.

The interdisciplinary nature of public health attracted **Nora Satybaldiyeva, MPH**, a current JDP student, to the field. With an undergraduate degree in biology and experience working in a psychology lab, she found that public health allowed her to study trends, associations and policy and health behavior, preparing her to work with population-level data.

“Psychology was too focused on individuals. Biology was too removed from working with people. Epidemiology blends it all together and allows you to focus on the population level,” said Satybaldiyeva, who expects to complete her doctoral degree in 2024.

“I also like that public health is focused as much on prevention as it is on treatment. For example, with cannabis and tobacco products, we are trying to change policy to prevent people from using these unregulated products and developing adverse health outcomes,” she adds.

### A 21st Century Doctorate

UC San Diego has been building a strong public health curriculum over the decades, beginning with the UC San Diego–San Diego State University General Preventive Medicine Residency program in 1983 to train physicians in preventive medicine and public health.

In 1990, it launched the JDP as its first degree in public health and was followed by a Bachelor of Science in Public Health in 2013, a Doctor of Philosophy in Biostatistics in 2016, a Master of Public Health in 2018 and a Master of Science in Biostatistics in 2019.

On September 19, 2019, the university took a transformational step by elevating public health from a department within the UC San Diego School of Medicine to a school in its own right, thus establishing Herbert Wertheim School of Public Health and Human Longevity Science at UC San Diego.

“The public health program has been growing rapidly with an explosive undergraduate program. But now UC San Diego is well-positioned to offer a second and complimentary doctoral training program that is truly modern, truly 21st century, that will serve us well now and for

generations to come,” said **Cheryl A.M. Anderson, PhD, MPH**, founding dean of Herbert Wertheim School of Public Health and the inaugural Hood Family Endowed Dean’s Chair in Public Health.

“We have an opportunity to be the first in the nation to establish an innovative doctoral degree in public health that provides training in health services research and implementation science that is grounded in the social determinants of health and community-engaged research,” she adds.

In 2023, UC San Diego submitted a proposal to establish a Doctor of Philosophy in Public Health with a concentration in health services research and implementation science in response to the increasing demand for training in these areas and the availability of such programs locally and nationally.

### Health Services Research and Implementation Science

“Traditional research allows us to design great interventions with a proven impact on addressing public health problems, but there is a disconnect in the implementation of those programs,” said **Kimberly Brouwer, PhD**, associate dean for education and student affairs at Herbert Wertheim School of Public Health. “What is exciting about the new doctoral program is that it will train public health leaders who are able to take proven interventions and think through how to implement them faster within the framework of a health care system or public health system.”

Health services research identifies public health needs and then develops and evaluates solutions. Implementation science is a bridge between research and practice that applies evidence-based interventions in real-world settings to impact communities and individuals who need them most.

It takes an average of 17 years to identify a public health problem, design a solution and finally implement it, according to **Lawrence Palinkas, PhD**, the Herbert Wertheim School of Public Health professor who led the design and application of the new doctoral degree.

“UC San Diego has the reputation of having perhaps one of the greatest concentrations of researchers in the field of

implementation science of any university in the country,” said Palinkas. “There are a number of resources across the campus that we can use and provide the best opportunities for our students.”

In addition to existing educational programs, UC San Diego already has the Dissemination and Implementation Science Center, housed within the Altman Clinical and Translational Research Institute, the Health Services Research Center, housed within the Herbert Wertheim School of Public Health, and The Design Lab.

In addition, Herbert Wertheim School of Public Health maintains extensive partnerships with community-based organizations and health care systems, including UC San Diego’s own academic hospital system. For doctoral students pursuing community-engaged research, this will provide crucial partnership development, community input and support, as well as education on the health issues that are most important to the impacted community.

“We realize that one of the biggest challenges to providing the best quality health

“We have an opportunity to be the first in the nation to establish an innovative doctoral degree in public health that provides training in health services research and implementation science...”



Cheryl A.M. Anderson, PhD, MPH





Lilian Perez, PhD, MPH

care is the disparities that exist in both the need for health care and the ability to meet that need,” said Palinkas.

“A program like this, which is targeted toward reducing those disparities and ensuring health equity for all of our citizens, is important for the San Diego area and essential for the field of public health overall.”

### Interconnected

The existing Joint Doctoral Program in Public Health focuses its training in the areas of epidemiology, health behavior and global health.

The new doctoral program complements these core programs by tapping into experts in health policy and health services research that already call UC San Diego home and whom already

mentor JDP students, including those working on HIV research, Medicare policy or tobacco control research.

Strong and **John Pierce, PhD**, Distinguished Professor at Herbert Wertheim School of Public Health, were influential mentors to **Eric Leas, PhD, MPH**, a 2017 alum of the JDP global health track.

Strong and Pierce are leaders in tobacco research who have influenced state and national policy on tobacco control. When Leas showed interest in applying data science to tobacco research, Strong and Pierce encouraged Leas to seek pioneers in the data science field at UC San Diego.

Currently an assistant professor at Herbert Wertheim School of Public Health, Leas is excited about his work in tobacco e-commerce. He is building a system that collects information from

companies selling tobacco products online and reviews whether the websites comply with current state laws. The current focus is on a statewide law that came into effect on December 22, 2022, prohibiting the sale of flavored tobacco products.

“What is really exciting about this space is that it’s not only research but also an investigation tool that allows every data point to be actionable and accessible to the State Attorney General or other authorities for enforcement,” said Leas. “Working with the state legislature, state policymakers and local authorities in San Diego has been a rewarding experience that contributes to both academic research and public health policy.”

Faculty within the school and across the university include some of the world’s leading authorities in health services research and implementation science. They often hold national seminars and trainings for researchers who are interested in branching into this field.

Perez has been among the beneficiaries of those trainings. She hadn’t been exposed to implementation science until she launched her career.

“If I had been exposed to it earlier, I probably would have pursued more work in this space, because there is a huge need for this in the public health field,” said Perez.

She may have started off focused on physical activity, but Perez now applies her skills to build intervention programs to other public health topics, including mental health, vaccinations, misinformation and other areas that advance health equity.

“I’m really trying to hone my implementation science skills, applying these to different projects. One of them is trying to look at the implementation of community-based interventions, gathering evidence around how and why that intervention worked, to help understand how to sustain it or scale it up,” said Perez.

“There is a greater recognition of the amazing potential this field can have in advancing the work we’re doing, especially in community-engaged research. Having an educational program at the doctoral level that focuses on implementation science, and having students learn about that early on, is truly important.” ●

