

# Outlook



Washington  
University in St. Louis

SCHOOL OF MEDICINE

SPRING 2023

## Data storyteller

*Pandemic insights and beyond*

# Outlook

Washington University School of Medicine  
OUTLOOK.WUSTL.EDU    SPRING 2023

MATT MILLER



**COVER** Ziyad Al-Aly, MD, a clinical epidemiologist at the School of Medicine, leverages the power of big data and advances in statistical methodologies to fill important knowledge gaps that may not be easily answered by other means of scientific inquiry. See page 16.



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Published by Washington University  
School of Medicine, WashU Medicine  
Marketing & Communications, MSC 8508-29-12700,  
660 S. Euclid Ave., St. Louis, MO 63110-1010 © 2023  
PHONE 314-286-0100 EMAIL [mmc@wustl.edu](mailto:mmc@wustl.edu)

Outlook is distributed three times a year to alumni, faculty, staff, students and friends of Washington University School of Medicine.

Issues are available online at [outlook.wustl.edu](http://outlook.wustl.edu).

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School leaders build policies to accelerate progress for women

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Lindley B. Wall, MD, the newly named Jacqueline N. Baker and W. Randolph Baker Professor in Pediatric Orthopaedics, examines a patient. See page 30.



Though significant national progress has been made toward gender equity in academic medicine, much work remains. WashU Medicine is creating policies to recruit and empower women students, trainees and faculty. Above: General surgery resident Emily Onufer, MD (left), shows off her laparoscopic surgery skills in the “Top Gun” competition at the Washington University Institute for Surgical Education. See page 23.

MATT MILLER

## DEPARTMENTS

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Photos of unmasked people in this magazine were taken prior to the COVID-19 pandemic or in accordance with School of Medicine masking protocols at that time.



BILLYOGRIN

Medical student Joshua Perez-Cruet (foreground) has worked to integrate climate change into the Gateway Curriculum. See page 8.



The study hints at the potential of sleep medications to slow or stop the progression of Alzheimer's disease.

# Sleeping pill reduces Alzheimer's protein levels in small study

**S**leep disturbances can be an early sign of Alzheimer's disease. Many people eventually diagnosed with Alzheimer's start experiencing difficulty falling and staying asleep years before cognitive problems such as memory loss and confusion emerge. It's a vicious cycle: Alzheimer's disease involves changes to the brain that disrupt sleep, and poor sleep accelerates harmful changes to the brain.

School of Medicine researchers have identified a possible way to help break that cycle. A small, two-night study has shown that people who took a sleeping pill before bed experienced a drop in the levels of key Alzheimer's proteins — a good sign, since higher levels of such proteins track with worsening disease. The study, which involved

a sleeping aid known as suvorexant that is already approved by the Food and Drug Administration (FDA) for insomnia, hints at the potential of sleep medications to slow or stop the progression of Alzheimer's disease, although much more work is needed to confirm the viability of such an approach.

"We don't yet know whether long-term use is effective in staving off cognitive decline, and if it is, at what dose and for whom," said senior author Brendan P. Lucey, MD, an associate professor of neurology and director of Washington University's Sleep Medicine Center. "Still, these results are very encouraging. This drug is already available and proven safe, and now we have evidence that it affects the levels of proteins that are critical for driving Alzheimer's disease."

Suvorexant belongs to a class of insomnia medications known as dual orexin receptor antagonists. Orexin is a natural biomolecule that promotes wakefulness. When orexin is blocked, people fall asleep. Three orexin inhibitors have been approved by the FDA, and more are in the pipeline.

Lucey and colleagues were among the first to show in people that poor sleep is linked to higher levels of both amyloid and tau in the brain. The question remains as to whether good sleep has the opposite effect — a reduction in amyloid and tau levels, and a halt in or reversal of the progress of Alzheimer's disease — but mouse studies with orexin inhibitors have been promising.

 [Annals of Neurology](#) | April 20, 2023



The FDA decision means that people with *SOD1* ALS now have access to a treatment that appears to slow down the neurodegenerative disease process.

## FDA approves drug for rare form of ALS

The Food and Drug Administration (FDA) has approved a new drug for a rare, inherited form of amyotrophic lateral sclerosis (ALS), a paralyzing neurological disease. Known as tofersen, the drug has been shown to slow progression of the deadly disease. International clinical trials of tofersen, developed by the global biotechnology company Biogen Inc., were led by School of Medicine neurologist Timothy M. Miller, MD, PhD.

Tofersen, also known by the brand name Qalsody, is designed for ALS patients whose disease is caused by mutations in the gene *SOD1*. In the phase 3 clinical trial, the drug reduced molecular signs of disease and curbed neurodegeneration in the first six months of use. Over longer time frames, some participants experienced a stabilization of muscle strength and control.

The drug is approved under the accelerated approval pathway, under which FDA may approve drugs for serious conditions where there is an unmet medical need and a drug is shown to have an effect on a surrogate endpoint that is reasonably likely to predict a clinical benefit to patients.

“ALS is a devastating and deadly disease,” said Miller, the David Clayson Professor of Neurology at Washington University and the principal investigator of the tofersen clinical trials. “The majority of patients experience a rapid and relentless decline in muscle strength that leads to death within five years. Up to now, we haven’t had any treatments that substantially change the course of the disease.”

To learn more about stories in Pulse, go to [medicine.wustl.edu/news](http://medicine.wustl.edu/news)

# Needlemans commit \$15 million to boost drug discovery

A \$15 million commitment from longtime benefactors Philip and Sima Needleman will enable WashU to leverage its expertise in biomedical discovery to boost drug development. The Needleman Program for Innovation and Commercialization (NPIC) will bridge the gap between the identification of promising therapeutic targets in the laboratory and the initiation of clinical trials to evaluate the safety and effectiveness of investigational drugs.

Traditionally, it has been immensely challenging to advance potential drug candidates identified in the laboratory into early-stage clinical trials, because this work requires substantial funding not available to academic researchers through traditional sources. The program will provide new support during this critical window in the drug development process.

For a small number of annually selected projects, the NPIC will provide funding to validate drug targets, perform pharmacokinetics and conduct extensive testing in model systems, with the goal of moving promising therapeutics to the stage where the Food and Drug Administration grants investigational new drug status. In some cases, the new center will support initial clinical trials as well. The new program complements and extends the university’s existing efforts in drug development and commercialization — drawing on a culture of innovative discoveries aimed at improving human health.

The Needleman program will provide much of the same infrastructure as a typical startup venture, including financial support, project management, external drug development funding, as well as mentoring in business and intellectual property management.

The Needleman program is accepting proposals. Visit [innovation.wustl.edu](http://innovation.wustl.edu) for more information.



Philip and Sima Needleman



Well-wishers celebrate the launch of the Needleman Program for Innovation and Commercialization and Philip Needleman’s 84th birthday. Admiring the cake (left to right): Dean David H. Perlmutter, MD, Needleman, PhD, Chancellor Andrew D. Martin and Provost Beverly Wendland.



Eric J. Lenze, MD, head of the Department of Psychiatry, holds an antidepressant drug in one hand and aripiprazole, originally approved as an antipsychotic, in the other.

## Treating depression in older adults

For older adults with clinical depression that has not responded to standard treatments, adding the drug aripiprazole (brand name Abilify) to an antidepressant they're already taking is more effective than switching from one antidepressant to another, according to a new multicenter study led by the School of Medicine.

The FDA approved aripiprazole in 2002 as a treatment for schizophrenia, but the drug also has been used in lower doses as an add-on treatment for clinical depression in younger patients who do not respond to antidepressants alone.

Many people with clinical depression don't respond to medications used to treat the condition. Consequently, some doctors switch such patients to different antidepressants in the pursuit of finding one that works, while other physicians may prescribe another class of drugs to see if a combination of medications helps.

Both strategies have been recommended by experts as options for older adults with treatment-resistant depression. However, the new study was designed to help determine which strategy is most effective. Augmenting an antidepressant with aripiprazole helped 30% of patients with treatment-resistant depression, compared to only 20% who were switched to another solo antidepressant, results of the study show.

"We found that adding aripiprazole led to higher rates of depression remission and greater improvements in psychological well-being — which means how positive and satisfied patients felt — and this is good news," said Eric J. Lenze, MD, principal investigator and head of the Department of Psychiatry. "However, even that approach helped only about 30% of people in the study with treatment-resistant depression, underscoring the need to find and develop more effective treatments that can help more people."

 The New England Journal of Medicine | March 3, 2023

## Targeting leading cause of foodborne infections

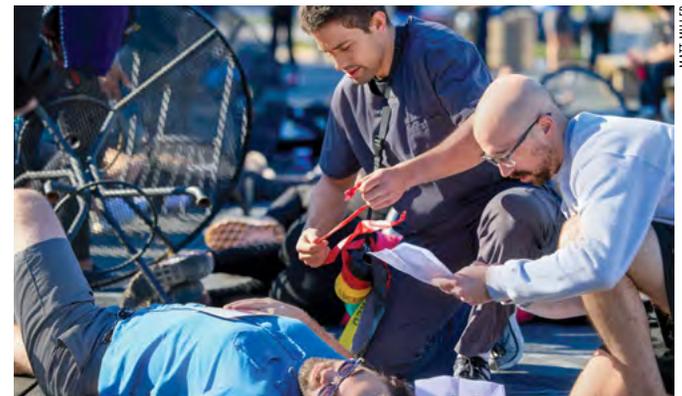
Every year, norovirus causes hundreds of millions of global food poisoning cases — and the deaths of at least 50,000 children. The virus has proven exceptionally difficult to study in the lab, and scientists have struggled to develop effective vaccines and drugs.

A new School of Medicine study describes a creative way to make a vaccine against norovirus by piggybacking on the highly effective vaccines for rotavirus, an unrelated virus that also causes diarrhea.

The researchers created an experimental rotavirus-norovirus combo vaccine by adding a key protein from norovirus to a harmless strain of rotavirus. Mice that received the experimental vaccine produced neutralizing antibodies against both rotavirus and norovirus. The study outlines an innovative approach to preventing infection.

"Pretty much everyone has had norovirus at some point," said senior author Siyuan Ding, PhD, an assistant professor of molecular microbiology. "You go out to eat, and the next thing you know you're vomiting and having diarrhea. You will recover, but it's going to be a rough three days or so. For kids in the developing world who don't have access to clean water, though, it can be deadly. The rotavirus vaccines work really well, and there are already global distribution systems set up for them, so based on that, we saw an opportunity to finally make some headway against norovirus."

 Proceedings of the National Academy of Sciences | Feb. 23, 2023



**PREPARING FOR THE WORST** WashU Medicine students recently headed to Forest Park to learn what can't be taught from a textbook: how to respond to a mass casualty event. The Department of Emergency Medicine conducted the mass-casualty simulation exercise at Steinberg Ice Rink.

# Change in breast density over time linked to cancer risk

**M**any middle-aged and older women get mammograms every one to two years to screen for breast cancer, as recommended by their doctors. A study by School of Medicine

researchers indicates that previous mammograms hold underutilized data that could help identify women at high risk of breast cancer and even reveal which breast is likely to be affected.

When doctors read mammograms, they assess breast density along with signs of cancer, comparing a woman's previous mammograms to her most recent one to look for worrisome changes. But some changes are difficult to detect by eye.

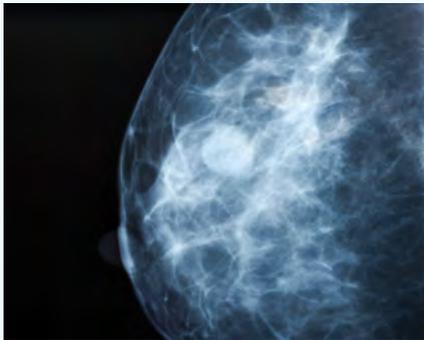
In the study, researchers used a mathematical model to monitor changes in breast density over the course of a decade in almost 1,000 women and found that the rate of change differed significantly between the nearly 300 women who were later diagnosed with cancer and those who were not. The findings, available online in *JAMA Oncology*,

could help refine current risk algorithms and aid efforts to identify women who could benefit from additional screening.

"Our best tool against breast cancer is early detection," said senior author Graham A. Colditz, MD, DrPH, associate director of the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine. "By adding the change in density over repeated images to models for risk classification in each breast, we set the stage for a better risk estimation with each updated mammogram. We can then better classify future risk and refer women to appropriate prevention strategies such as enhanced screening as part of routine breast health services."

 *JAMA Oncology* | April 27, 2023

GETTY IMAGES



Repeated mammograms contain data on changes in breast density over time.

# Developing a vaccine against all deadly coronaviruses

**W**hat if a vaccine could protect people against all potentially deadly coronaviruses before one of them started the next pandemic?

School of Medicine researchers are working to reduce the risk of another devastating coronavirus pandemic by creating what is known as a pan-coronavirus vaccine. Such a vaccine is designed to reduce sickness and death resulting from the virus that causes COVID-19 as well as any other coronaviruses of concern, including ones that have not yet affected people. The research is supported by an \$8 million grant from the National Institute for Allergy and Infectious Diseases of the National Institutes of Health (NIH).

There are good reasons to be prepared. Three times in the past two decades a coronavirus has emerged to sicken and kill people around the world. The severe acute respiratory syndrome (SARS) outbreak

of 2003 killed 774 people. Middle East respiratory syndrome (MERS) coronavirus emerged in 2012 and has killed just under 1,000 people to date. The official death toll of the ongoing COVID-19 global pandemic is about 7 million, but the true total could be 15 million or more. And there's no reason another coronavirus couldn't emerge to threaten people again.

"Some coronaviruses that circulate in animals are just a few mutations away from having pandemic potential," said co-principal investigator Michael S. Diamond, MD, PhD, the Herbert S. Gasser Professor of Medicine and a professor of molecular microbiology, and of pathology and immunology.

The researchers are targeting their efforts to a subgroup known as betacoronaviruses because all of the strains most dangerous to people — the SARS, MERS and COVID-19 viruses — belong to that group.

MATT MILLER



School of Medicine scientists Michael S. Diamond, MD, PhD (left), and Sean Whelan, PhD.

To design a pan-coronavirus vaccine, the research team first aims to identify parts of coronaviruses that remain consistent across the family, and then determine which of these viral regions elicit a strong and protective immune response. The team plans to target both the antibody response, which is important for reducing infection and transmission, and the cellular response, which is crucial for preventing severe disease and death.



## Finding a route to safer pain meds

Strategies to treat pain without triggering dangerous side effects such as euphoria and addiction have proven elusive. For decades, scientists have attempted to develop drugs that selectively activate one type of opioid receptor to treat pain while not activating another type of opioid receptor linked to addiction. Unfortunately, those compounds can cause a different unwanted effect: hallucinations.

A School of Medicine study has identified a potential route to pain relief that neither triggers addiction nor activates the pathway that causes hallucinations.

Painkilling drugs such as morphine and oxycodone, as well as illegal street drugs such as heroin and fentanyl, activate what are known as mu opioid receptors on nerve cells. Those receptors relieve pain but also cause a feeling of euphoria that contributes to addiction. An alternative strategy is to target the kappa opioid receptor. Scientists attempting to make drugs that target only the kappa receptor have found that they also effectively relieve pain, but they can be associated with side effects such as hallucinations.

Researchers at the Center for Clinical Pharmacology at the School of Medicine and the University of Health Sciences & Pharmacy have identified the potential mechanisms behind such hallucination. Using electron microscopes, they identified the way that a natural compound related to the salvia plant selectively binds only to the kappa receptor but then causes hallucinations.

“Since 2002, scientists have been trying to learn how this small molecule causes hallucinations through kappa receptors,” said principal investigator Tao Che, PhD, an assistant professor of anesthesiology. “We determined how it binds to the receptor and activates potential hallucinogenic pathways, but we also found that other binding sites on the kappa receptor don’t lead to hallucinations.”

 Nature | May 3, 2023

## WashU Med people

### Hultgren, Solnica-Krezel elected to academy



Scott J. Hultgren

Scott J. Hultgren, PhD, the Helen L. Stoeber Professor of Molecular Microbiology, and Lilianna Solnica-Krezel, PhD, the Alan A. and Edith L. Wolff Distinguished Professor and head of the Department of Developmental Biology, are among nearly 270 newly elected members of the American Academy of Arts & Sciences, one of the nation’s most prestigious honorary societies.

Hultgren is recognized for his pioneering research in nonantibiotic treatments and preventives for urinary tract infections (UTIs), one of the most common infections.

Hultgren’s investigations of the bacterial and host mechanisms underlying UTIs have led to the identification of alternative therapies based on preventing bacteria from causing disease without killing the bacteria.



Lilianna Solnica-Krezel

Solnica-Krezel is an expert in understanding the earliest stages of embryonic development in vertebrates, with special expertise in studying zebrafish as a model organism.

Solnica-Krezel led efforts to establish one of the largest and most technologically advanced zebrafish research facilities in the world, helping make Washington University a leader in the field of developmental biology.

### Radiology department head named



Pamela K. Woodard

Pamela K. Woodard, MD, a national leader in cardiothoracic imaging, has been named head of the Department of Radiology, director of the Mallinckrodt Institute of Radiology (MIR) and the Elizabeth E. Mallinckrodt Professor of Radiology at the School of Medicine, effective July 1.

She is currently the Hugh Monroe Wilson Professor of Radiology, senior vice chair and division director of MIR’s Radiology Research Facilities, director of the Center for Clinical Imaging Research, head of Advanced Cardiac Imaging CT/MRI, director of the Radiology Research Residency Program, and director of TOP-TIER, a clinician-scientist training program for residents and fellows.

Also a professor of medicine, of pediatrics and of biomedical engineering, Woodard conducted seminal research that led to the translation of cardiac magnetic resonance imaging (MRI) into clinical practice, including methods to improve imaging quality by suppressing respiratory motion. Such methods are in use in pediatric cardiac and congenital heart imaging.

Woodard will succeed Richard L. Wahl, MD, who will continue to lead a research laboratory as a professor in the department.

# Red flags signal early-onset colorectal cancer risk

**S**chool of Medicine researchers have identified four important signs and symptoms that signal an elevated risk of early-onset colorectal cancer. These red flags may be key to earlier detection and diagnosis of early-onset colorectal cancer among younger adults. The number of young

adults with colorectal cancer has nearly doubled in recent years.

Studying de-identified health insurance data on more than 5,000 patients with early-onset colorectal cancer — cancer that occurs before a person turns 50 — the researchers found that in the period between three months and two years before diagnosis, abdominal pain, rectal bleeding, diarrhea and iron deficiency anemia each indicate an increased risk in those under age 50. They found that having a single one of the symptoms almost doubled the risk; having two symptoms increased risk by more than 3.5 times; and having three or more boosted the risk by more than 6.5 times.

“Colorectal cancer is not simply a disease affecting older people; we want younger adults to be aware of and act on these

potentially very telling signs and symptoms — particularly because people under 50 are considered to be at low risk, and they don’t receive routine colorectal cancer screening,” said senior investigator Yin Cao, ScD, an associate professor of surgery in the Public Health Sciences Division, and a research member of Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine.

Cao said two symptoms in particular — rectal bleeding and iron-deficiency anemia, a condition in which there are not enough healthy red blood cells to carry oxygen — point to the need for timely endoscopy and follow-up.

 **Journal of the National Cancer Institute**  
May 4, 2023



GETTY IMAGES

# Alternative approaches to treating Alzheimer’s

**N**early two dozen experimental therapies targeting the immune system are in clinical trials for Alzheimer’s disease, a reflection of the growing recognition that immune processes play a key role in driving the brain damage that leads to confusion, memory loss and other debilitating symptoms.

Many of the immunity-focused Alzheimer’s drugs under development are aimed at microglia, the brain’s resident immune cells, which can injure brain tissue if they’re activated at the wrong time or in the wrong way. A new study from School of Medicine researchers indicates that microglia partner with another type of immune cell — T cells — to cause neurodegeneration.

Studying mice with Alzheimer’s-like damage in their brains due to the protein tau,

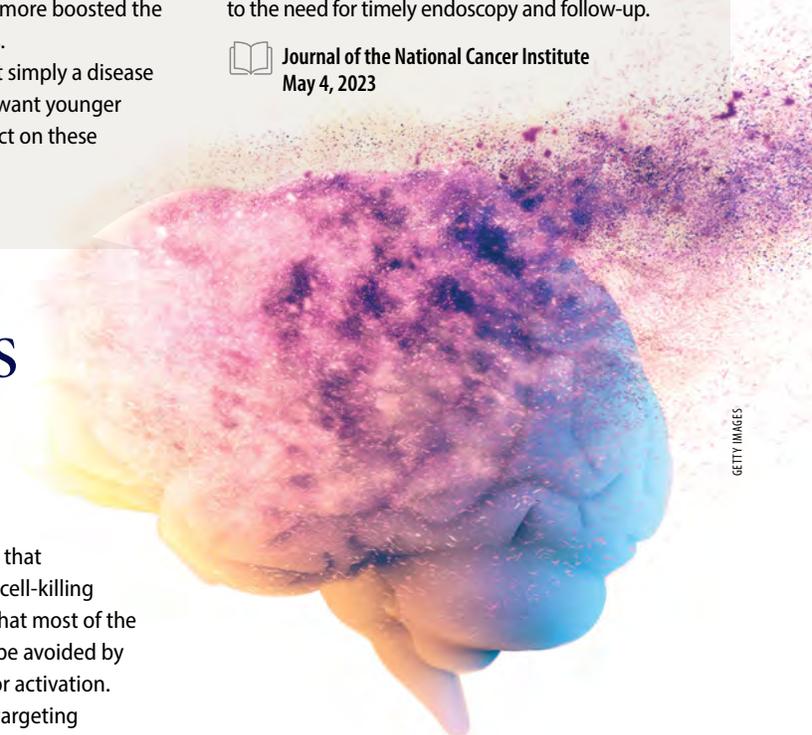
the researchers discovered that microglia attract powerful cell-killing T cells into the brain, and that most of the neurodegeneration could be avoided by blocking the T cells’ entry or activation. The findings suggest that targeting T cells is an alternative route to preventing neurodegeneration and treating Alzheimer’s disease and related diseases involving tau, collectively known as tauopathies.

“This could really change the way we think about developing treatments for Alzheimer’s disease and related conditions,” said senior author David M. Holtzman, MD, the Barbara Burton and Reuben M. Morriss III Distinguished Professor of Neurology. “Before this study, we knew that T cells were increased in the brains of people with Alzheimer’s disease and other tauopathies,

but we didn’t know for sure that they caused neurodegeneration.

“These findings open up exciting new therapeutic approaches. Some widely used drugs target T cells. Fingolimod, for example, is commonly used to treat multiple sclerosis, which is an autoimmune disease of the brain and spinal cord. It’s likely that some drugs that act on T cells could be moved into clinical trials for Alzheimer’s disease and other tauopathies if these drugs are protective in animal models.”

 **Nature** | March 8, 2023



GETTY IMAGES

Joshua Perez-Cruet and fellow medical students nationally are calling for more education on climate change.

# Are doctors pre

Meeting the health challenges of climate change

# pared?

BY ADAM LIEBENDORFER

In late 2021, Washington University medical student Joshua Perez-Cruet (WUSM 2025) found himself in Senior Associate Dean of Medical Education Eva Aagaard's office to address an omission in the school's curriculum. Throughout the entirety of the Gateway Curriculum's preclinical phase, the health effects of climate change were mentioned only once, tucked into a single paragraph in a required reading.

The disconnect stuck with Perez-Cruet. An avid outdoorsman, he had studied ecology and evolutionary biology, with a resume ranging from managing endangered species in Colorado to studying river-bottom invertebrates as indicators of ecosystem health.

"That single paragraph was about what I expected," Perez-Cruet said. "The medical school curriculum is already so saturated with content that integrating anything new requires a lot of intentionality and advocacy. What was truly astonishing to me was the scarcity of existing climate curricula for medical schools."

As the two discussed what could be done, Aagaard suggested Perez-Cruet consider designing sessions for the Gateway Curriculum, as part of the EXPLORE phase Education Pathway.

With the help of faculty mentors and other students, Perez-Cruet has designed sessions for the curriculum's preclinical phase, each tailored to integrate with various learning modules. In doing so, Perez-Cruet has become a thread leader, a role usually reserved for faculty who manage longitudinal content across modules.

“From my perspective, what Josh and his fellow students have done has been so impressive on so many levels,” said Aagaard, MD, also the Carol B. and Jerome T. Loeb Professor of Medical Education. “With his thoughtfulness and creativity and understanding of the complexity of trying to change a curriculum, he has essentially been approaching the sessions at the level of a thread leader and has made something really valuable from an educational perspective.”

In an educational landscape where doctors traditionally receive little training in environmental health, Perez-Cruet’s sessions stand out. Climate change has become a major driver in public health issues, putting physicians increasingly in the position of explaining its effects. Integrating such content into medical school curricula, however, has been highly variable and often lagging behind what is known about these associations.

“Doctors are at the center of so many decisions in health care and have such a platform,” Perez-Cruet said. “Talking from a health perspective has a really strong potential to resonate with people who wouldn’t otherwise engage in discussions around climate change, such as improving waste sorting in the operating room or choosing sustainable suppliers.”

## Becoming more climate-conscious

As it happened, Perez-Cruet’s interest in medical education came right as MedEdPORTAL, a prominent medical education journal, issued a call for papers about teaching students the links between health and climate change.

Perez-Cruet teamed up with Janice L. Hanson, PhD, professor of medicine and the director of education scholarship development and co-director of the Medical Education Research Unit, to hone his research methods and understand the impact of his educational interventions.

“Climate change was a hot topic at the Association of American Medical Colleges (AAMC) meeting last November,” Hanson said. “It was a key theme with a plenary speaker and many sessions devoted to this topic. So that says two things. Medical educators have realized that we need to address climate change and that the AAMC was interested in providing some motivation and information to help schools.”

As part of the trial rollout at WUSM, students chose between four breakout sessions that touched on different aspects of climate change. Through an interactive game, the students then taught each other content from the sessions. Post-session surveys showed that the information increased students’ understanding of the cause and effects of climate change, health care’s contributions to climate change, and opportunities to mitigate these impacts. After the session, nearly every student felt more likely to make future efforts to reduce the environmental impacts of health care.

The content has been integrated into the Gateway Curriculum’s first module, called “Molecules to Society,” for future medical school classes.

“The key with implementing new sessions is to have forward-thinking individuals to constantly revise and think about how the curriculum can get better,” said James Li, MD, an assistant professor of emergency medicine who led one of the breakout sessions. “Climate change can be a

## How health care contributes to climate change

The health-care industry is among the largest contributors of greenhouse gas pollution. Accounting for 8.5% of domestic carbon emissions, the carbon footprint of the U.S. health-care industry alone would rank 13th among countries.



### 6x more electricity

Hospitals use 6x more electricity per square foot than an average home.



### 75 million cars

Cooling hospitals equates to the emissions from 75 million cars each year.

### Greenhouse gases

Anesthetic gases commonly used in operating rooms are extremely potent greenhouse gases. Most anesthesia gases are not metabolized by the patient, but instead are exhaled, expelling the gas into the atmosphere.



political topic, but reframing it by centering on the patient is an important way to look at it. Josh did a great job doing just that.”

Perez-Cruet now is focused on the next curriculum challenge: keeping the environmental health focus going after he graduates. His efforts have expanded to an additional three modules in the preclinical immunology, pulmonology and gastrointestinal units, with four more in the works. In the curriculum’s second module, focused on infectious disease and immunology, Perez-Cruet’s team developed an interactive session that explores the spread of vector-borne diseases as a result of climate change. It concludes with a cancer care case study on the shortage of IV bags after Hurricane Maria shut down Puerto Rican manufacturing plants in 2017. A session on air pollution and wildfires, which dovetails with the pulmonology unit, will equip students with strategies for protecting patients disproportionately impacted by exposures to different air pollutants.

“With the Gateway Curriculum, we’ve been really, really thoughtful about what the right level is that we’re trying to hit for content,” Aagaard said. “It requires an iterative thought process and a partnership with the students to make sure we’re hitting things at the right stage and the right depth. Being thoughtful about this lets us add new content and eliminate content more easily.”

The end goal, Perez-Cruet said, is to prepare medical students to practice in a world increasingly impacted by climate change and empower them to take mitigative and adaptive measures.

“Health-care sector engagement is imperative to climate change mitigation and adaptation,” he said. “We all took a pledge to do no harm at

the very beginning of our training, and yet we contribute disproportionately to environmental degradation as a sector.”

## Impact of health care on climate

The health-care industry is among the largest sources of greenhouse gas pollution. Accounting for 8.5% of domestic carbon emissions, the carbon footprint of the U.S. health-care industry alone would rank 13th among countries. Hospitals require more than six times as much electricity per square foot as an average home, and cooling hospitals equates to the emissions from 75 million cars each year.

These emissions raise a concerning paradox seldom discussed in hospital wards: the harmful health impacts of health care itself as an industry.

“I think you can get paralyzed by the scope of the problem,” Perez-Cruet said. “But advocacy is about putting your actions behind your words.”

As just one example of advocacy, the Medical Campus has taken aim at volatile gases used during operative procedures.

In 2016, Barnes-Jewish Hospital spent close to \$1 million on volatile anesthetics. Much of this was spent on desflurane, the most expensive volatile agent, which has the advantage of quickly leaving the body after procedures. This is particularly advantageous in patients who are overweight or obese.

Desflurane, however, has approximately 2,540 times the carbon footprint of carbon dioxide. To make things worse, if administered at unnecessarily high flow rates, most of it escapes to the atmosphere without entering the patient.

## New guidelines

WashU Medicine anesthesia clinicians now are advised to use desflurane only in specific situations in which it would make a clinical difference.



### 1,500 gallons of gas

Barnes-Jewish Hospital is practically desflurane-free, eliminating the carbon dioxide equivalent of burning almost 1,500 gallons of gasoline every week.



### 60% reduction

By 2019, desflurane usage was only one-quarter of its 2016 levels, amounting to a carbon footprint reduction of 60% — all with no effect on patient outcomes.



### \$400,000 savings

These changes have resulted in a savings of \$400,000 annually.



## DESFLURANE VS SEVOFLURANE

**300+ miles**

One hour of desflurane use in a single patient generates a carbon footprint comparable to driving 300-plus miles — a drive from St. Louis to Nashville, Tennessee.

**8 miles**

The footprint of a similar agent, sevoflurane, equates to only eight miles.



When administered at high flow rates, one hour of desflurane use in a single patient can generate a carbon footprint comparable to driving more than 300 miles — a drive from St. Louis to Nashville. By comparison, the footprint of a similar agent, sevoflurane, equates to about eight miles.

“We need to be cognizant of the medical costs and benefits but also of the environmental costs and benefits,” said Ryan Guffey, MD, an anesthesiologist who helped spearhead the initiative. “The environmental costs of treatments aren’t on the drug label.”

A group — including Guffey, Helga Komen, MD, assistant professor of anesthesiology, and Ivan Kangrga, MD, PhD, professor and director of clinical anesthesiology — drafted guidelines for WashU Medicine anesthesia clinicians to use desflurane only in specific situations in which it would make a clinical difference.

*“The environmental costs of treatments aren’t on the drug label.” — Ryan Guffey, MD*

They partnered with the Barnes-Jewish Hospital pharmacy to create a training module for anesthesia clinicians. The group also collaborated with the Anesthesia Control Tower, an innovative telemedicine team launched by the anesthesiology department, to develop a clinical decision support program. This program alerts clinicians if the flow rates of desflurane or other volatile agents are unnecessarily high.

The group expanded to include Perez-Cruet and third-year medical student Caellagh Catley and is working to analyze the longitudinal outcomes of these interventions. Use of desflurane has plummeted. By 2019, the usage was only one-quarter of its 2016 levels, amounting to a savings of \$400,000 annually and a carbon footprint reduction of 60% — all with no effect on patient outcomes. Led by this anesthesiology department initiative, Barnes-Jewish Hospital has practically become a desflurane-free facility.

On the heels of its success with volatile anesthetics, the Department of Anesthesiology has begun taking steps to drive down its use of gases even further. The department is relying less on inhaled gases for delivering intraoperative anesthesia and instead using intravenous anesthetics, such as propofol.

## Climate change & clinical practice

While climate change affects health care at the macro level, a warming planet already has begun to change providers’ day-to-day interactions with patients. Warmer temperatures can push the geographic boundaries of where certain diseases would be expected and bring more patients in with asthma and heat-related complaints.

A growing body of evidence has focused on the effects of climate change in facilitating the evolution of multidrug-resistant superbugs. Jason P. Burnham, MD, assistant professor of medicine, published a review in 2021 that has laid the groundwork for future research into these links.

The picture it paints of the future of antibiotic resistance can be as clear-cut as it is uncertain. Microplastics in waterways have been found to act as a collecting point for bacteria to share genes. Pollution, fertilizer use and warmer temperatures all can promote mutation formation as well, accelerating antibiotic resistance and unbalancing ecosystems’ ability to keep infectious diseases in check.

Burnham poses one scenario: A currently treatable bacteria species endemic to the Gulf of Mexico is routinely exposed to fertilizer from the Mississippi River and pollution from chemical companies along the Gulf while it collects on microplastics. Increasingly severe hurricane seasons fling these newly hardened germs farther inland, where shifting temperatures allow them to gain a foothold.

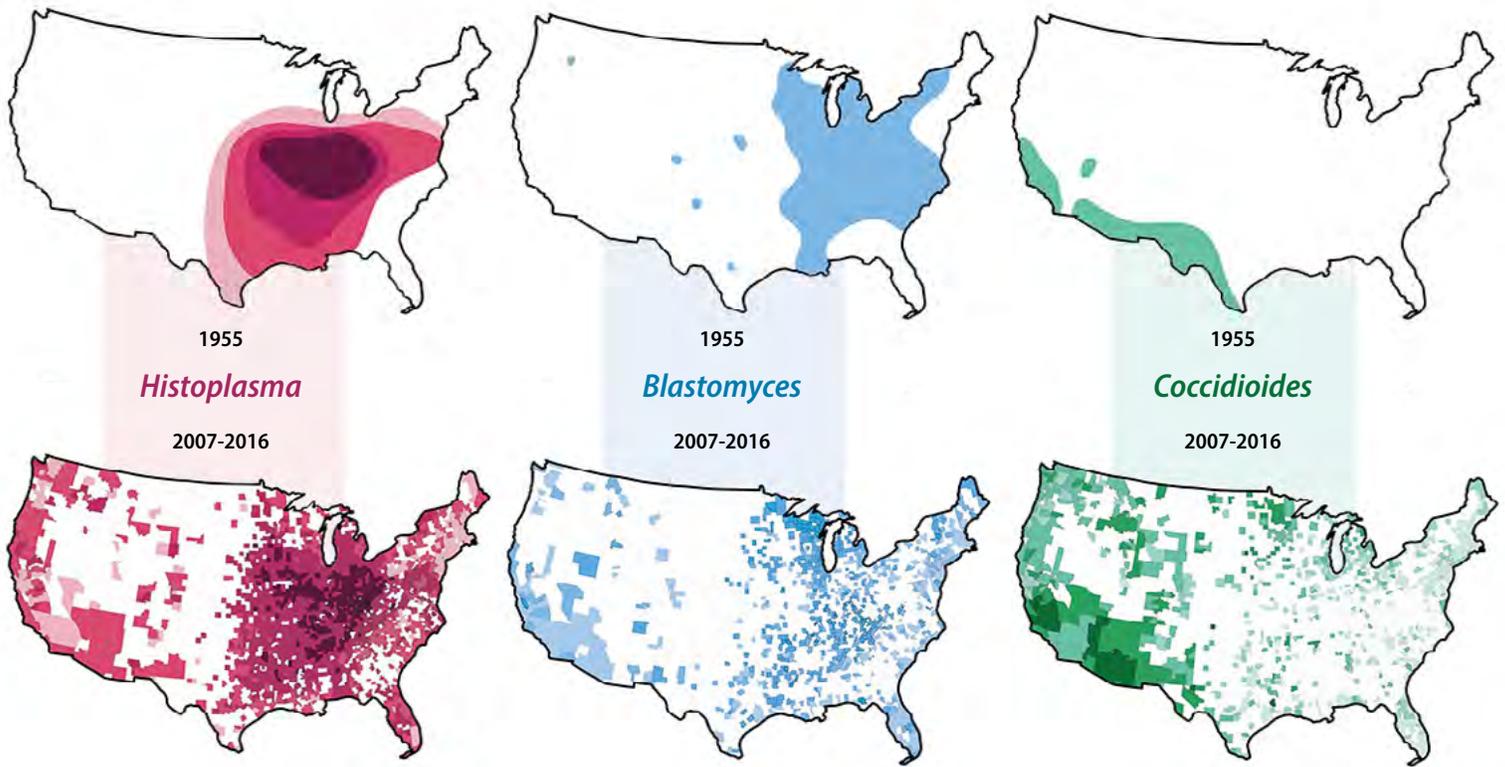
But, he points out, it isn’t always easy to determine precisely how ecological factors add up to clinical changes.

“Drought is surprisingly good for malaria because it kills off mosquitoes’ predators,” Burnham said. “So you can get more malaria when it’s dry, even though you would think there would be more mosquitoes when it’s wet because of more standing water.”

Looking at all of these factors operating together will be crucial for understanding and predicting antibiotic resistance and other mutations in the years ahead.

“Many fungi struggle to live at human body temperature, which is why most fungal infections occur in immunocompromised patients,” said infectious disease and critical care fellow Patrick B. Mazi, MD. “The fungi cannot overcome the less-than-ideal temperature and a normal immune system. But if they were to adapt to living at human body temperatures, it would be extremely problematic.

“If you look at the history of species-level extinction events, they are frequently caused



by fungi. It's typically not viruses, not bacteria, for the most part. As an example, amphibians are ectothermic and don't have higher body temperatures to provide some protection against fungal pathogens. As a result, a single type of fungal infection, *chytridiomycosis*, has ripped through the environment resulting in the extinction of nearly 100 amphibian species."

Mazi is working with other WashU Medicine researchers to reexamine our understanding of how fungal infections are distributed in the U.S.

Their work takes aim at key assumptions doctors are trained to make about North America's endemic fungal infections, called mycoses. For most medical board exams, trainees are expected to use geography to help guide their diagnosis. *Histoplasma* species, for example, are traditionally known to lurk in the Ohio River Valley, whereas *Blastomycosis* is associated with the northern Midwest, and *Coccidiomycosis* inhabits the arid Southwest.

These observations, however, relied on a study that was conducted more than 70 years ago.

The group's database showed that the locations where fungal mycoses thrive, likely due to climate change, are much more widespread than their previously assumed distributions. Mazi has called into question whether the label of "endemic," meaning pertaining to a geographical area, should be used at all. "I almost never bet against fungus when it comes to being able to adapt in an environment," he said.

While many patients overcome such infections relatively unscathed with a recoverable form of pneumonia, a more accurate map reflecting the movement of mycoses could prove lifesaving for the growing number of Americans who are living with compromised immune systems. For such patients, a fungal infection may pose serious — sometimes fatal — risks.

"Every few weeks I get a call from a doctor in the northeast U.S. — a different doctor every time — about a case they can't solve," said senior author Andrej Spec, MD, an associate professor of medicine and a specialist in fungal infections. "They always start by saying, 'We don't have *histo* here, but it really kind of looks like *histo*.' I say, 'You guys call me all the time about this. You do have *histo*.'"

The team also created [mycoses.org](http://mycoses.org), which helps physicians quickly look up the incidence of endemic fungal infections in an area.

Climate change is redrawing the clinical map, and new tools — and vigilance — are required to make sense of these changes so that clinicians can optimize care for their patients.

From world-class work on fungi to eliminating harmful greenhouse gases to innovative medical education scholarship, WashU Medicine increasingly has been marshaling its resources as an academic powerhouse — pushing our understanding of how climate changes will affect human health and developing tools for mitigation. □

## Rise of fungal diseases

The three main species of fungi that cause lung infections in the U.S. — *Histoplasma*, *Blastomyces* and *Coccidioides* — have all expanded their ranges in recent decades, likely due to warmer temperatures. These maps were created based on data from 1955 (top row) and 2007-2016 (bottom row).



# Match Day 2023

Revelry mixed with reverence March 17 as the Class of 2023 celebrated Match Day, an annual ritual in which graduating medical students learn where they will train for residency. The event took place at the Eric P. Newman Education Center (EPNEC) on the Medical Campus. EPNEC's auditorium resembled pre-pandemic times with the students' loved ones cheering them on. WashU deans, faculty and staff also shared in the happiness.

**27**

Surgery

**25**

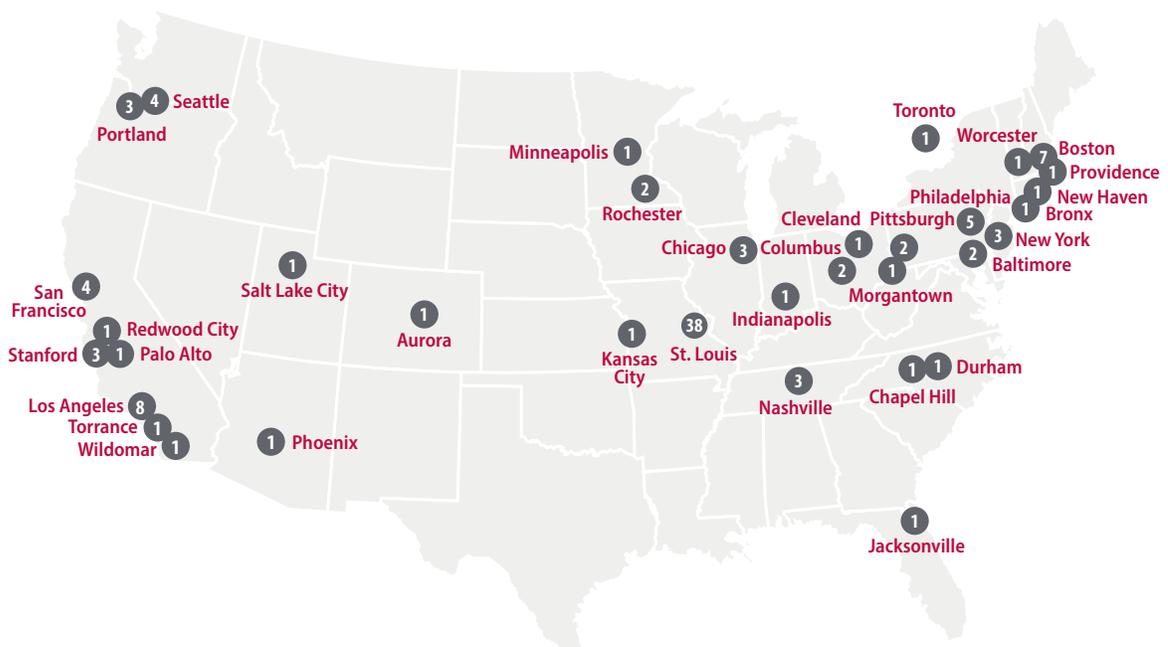
Internal  
Medicine

**11**

Psychiatry

**8**

Obstetrics-  
gynecology



## ARIZONA

**Mayo Clinic**  
UROLOGY  
Adam Ostergar

## CALIFORNIA

**Cedars-Sinai Medical Center**  
INTERNAL MEDICINE  
Alex Wessel  
ORTHOPAEDIC SURGERY  
Zachery Hong  
UROLOGY  
Alex Shiang

**Harbor-UCLA Medical Center**  
INTERNAL MEDICINE  
Marina Nguyen

**Stanford Health Care**  
INTERNAL MEDICINE  
Emma Winkler  
Ziheng Xu  
ORTHOPAEDIC SURGERY  
Toby Barrack  
SURGERY (PRELIMINARY)  
Drew Del Toro

**UHS Southern California  
Medical Education Consortium**  
GENERAL SURGERY  
Valerie Zike

**University of California-**

**Los Angeles Medical Center**  
EMERGENCY MEDICINE  
Jack Basse  
INTERNAL MEDICINE  
(PROSTAR/PSTP)  
Po wei "Billy" Kang  
NEUROLOGICAL SURGERY  
David Lauzier  
PLASTIC SURGERY  
(INTEGRATED)  
Sarah Chiang  
RADIOLOGY-DIAGNOSTIC  
Genevieve Munoz

**University of California-**

**San Francisco**  
INTERNAL MEDICINE  
Alexander Conway  
Cyrus Ghaznavi  
Vincent Peng  
NEUROLOGY  
Lauren Broestl

## COLORADO

**University of Colorado  
School of Medicine-Aurora**  
OBSTETRICS-GYNECOLOGY  
Kamilah Abdur-Rashid

## CONNECTICUT

**Yale-New Haven Hospital**  
PLASTIC SURGERY  
(INTEGRATED)  
Janessa Sullivan

## FLORIDA

**University of Florida  
College of Medicine**  
EMERGENCY MEDICINE  
Kristin Pfeifauf

## ILLINOIS

**Northwestern McGaw/NMH/VA**  
ORTHOPAEDIC SURGERY  
Patrick England

**University of Chicago**

**Medical Center**  
ANESTHESIOLOGY  
Matthew Millett  
ORTHOPAEDIC SURGERY  
Patrick Ward

## INDIANA

**Indiana University  
School of Medicine**  
ORTHOPAEDIC SURGERY  
Ruba Sokrab

## KANSAS

**University of Kansas  
School of Medicine**  
ORTHOPAEDIC SURGERY  
Thomas Bane

## MARYLAND

**Johns Hopkins Hospital**  
PSYCHIATRY  
Anna Dowling  
RADIOLOGY-DIAGNOSTIC  
Pramodh Ganapathy

## MASSACHUSETTS

**Beth Israel Deaconess  
Medical Center**  
INTERNAL MEDICINE  
Amy Zhang

**Boston Children's Hospital**  
PEDIATRICS  
Jennifer Lee

**Boston University Medical Center**  
MEDICINE (PRIMARY CARE)  
Angela Cattani

**Brigham & Women's Hospital**  
INTERNAL MEDICINE  
Maximilian Schaettler  
Sukruth Shashikumar

**Massachusetts General Hospital**  
ANESTHESIOLOGY (PG 1-4)  
Gopika Hari  
PSYCHIATRY  
Craig Pearson

**University of Massachusetts  
Chan Medical School**  
EMERGENCY MEDICINE  
Olga Neyman

## MINNESOTA

**Mayo Clinic School of  
Graduate Medical Education**  
DERMATOLOGY  
Bruin Pollard  
PEDIATRICS  
Haley Sherburne

**University of Minnesota**

**Medical School**  
ORTHOPAEDIC SURGERY  
Christopher Chermiside-  
Scabbo

## MISSOURI

**Barnes-Jewish Hospital**  
DERMATOLOGY  
(PHYSICIAN SCIENTIST)  
Rita Chen  
EMERGENCY MEDICINE  
William Freeman  
GENERAL SURGERY  
Jonathan Tang  
INTERNAL MEDICINE  
Curtis Broberg  
Arwa Mohammad  
Nirmala Shivakumar  
Joseph Banton  
Jeffrey Tarrasch  
Amy Zhao  
NEUROLOGICAL SURGERY  
Andrew Coxon  
Gabrielle Johnson

**OBSTETRICS-GYNECOLOGY**  
Katherine Carbonell  
Sarah Cohen  
Alexandra Houston-Ludlam  
ORTHOPAEDIC SURGERY  
Emma Payne  
OTOLARYNGOLOGY  
Samuel Cler  
PHYSICAL MEDICINE &  
REHABILITATION

Ashwin Leo  
PLASTIC SURGERY  
(INTEGRATED)  
Karim Saoud  
PSYCHIATRY  
Michelle Bagwell  
Michelle Cai  
Stanley Chibueze  
Christopher Douglas  
Miranda Liang  
RADIOLOGY ONCOLOGY  
Alden D'Souza  
RADIOLOGY-DIAGNOSTIC  
Jacqueline Hampton  
Austin Hannemann  
Kushanth Mallikarjun  
Kevin Naceanceno  
SURGERY (PRELIMINARY)  
Adam Liebendorfer  
VASCULAR SURGERY  
Ryan Wahidi

**Mercy Hospital St. Louis**  
OBSTETRICS-GYNECOLOGY  
Lucy Simpson

**St. Louis Children's Hospital**  
PEDIATRICS  
Kelsie Kodama  
Hannah Lucas  
Alex Shimony

**St. Louis University  
School of Medicine**  
DERMATOLOGY  
Faisal Ahmad

**St. Luke's Hospital**  
INTERNAL MEDICINE  
Urvi Holmes

**Washington University**  
OPHTHALMOLOGY  
Rajwant Mahal  
Alexandra Zdonczyk

## NEW YORK

**Memorial Sloan Kettering**  
RADIATION ONCOLOGY  
Gideon Haber

**New York Presbyterian  
Hospital-Columbia University  
Medical Center**

PSYCHIATRY  
Mary Elizabeth Guard  
**New York University Grossman  
School of Medicine**  
RADIOLOGY-DIAGNOSTIC  
Winston Winkler

## NORTH CAROLINA

**Duke University Medical Center**  
ANESTHESIOLOGY  
Victoria Offei-Dua

**University of North  
Carolina Hospitals**  
INTERNAL MEDICINE/  
RESEARCH  
Manasi Malik

## OHIO

**Case Western/University Hospitals**  
PEDIATRICS  
Samantha Kauffman  
**Ohio State University  
Medical Center**  
OTOLARYNGOLOGY  
Emily Yan  
THORACIC SURGERY  
Aaron Guo

## OREGON

**Oregon Health &  
Science University**  
INTERNAL MEDICINE  
Julia Hamilton  
OBSTETRICS-GYNECOLOGY  
Carter Scott  
OTOLARYNGOLOGY  
Cole Pavelchek

## PENNSYLVANIA

**Children's Hospital of Philadelphia**  
PEDIATRICS  
Jonathan Yu

**Hospital of the University  
of Pennsylvania**  
OBSTETRICS-GYNECOLOGY  
Ashley Amukamara  
MEDICINE (PRIMARY CARE)  
Madeline Danforth  
PSYCHIATRY/RESEARCH  
TRACK (EPSP)  
Lindsey Brier

**Scheie Eye Institute-  
University of Pennsylvania**  
OPHTHALMOLOGY  
Jennifer Chung

**University of Pittsburgh  
Medical Center**

INTERNAL MEDICINE  
Amish Khan  
PSYCHIATRY/CHILD  
Kalyan Tripathy

## RHODE ISLAND

**Brown University/  
Women & Infants Hospital**  
OBSTETRICS-GYNECOLOGY  
Nikita Sood

## TENNESSEE

**Vanderbilt University  
Medical Center**  
ANESTHESIOLOGY  
Rachel Rios  
INTERNAL MEDICINE  
Alexandria Lenyo  
PEDIATRICS  
Sindhu Manivasagam

## UTAH

**University of Utah Health**  
PATHOLOGY/AP-CP  
COMBINED  
John Daines

## WASHINGTON

**University of Washington  
Affiliated Hospitals**  
ANESTHESIOLOGY  
Xinwen Hu  
Nathan Lohner  
PLASTIC SURGERY  
(INTEGRATED)  
Michael Finnan  
PSYCHIATRY/RESEARCH  
Robert Chen

## WEST VIRGINIA

**West Virginia University  
School of Medicine**  
GENERAL SURGERY  
Matthew Richards

## CANADA

**University of Toronto**  
ANESTHESIOLOGY  
Chioma Odozor

WashU Medicine nephrologist Ziyad Al-Aly, MD, rose to prominence with his studies linking long-term use of heartburn drugs to chronic kidney disease and adverse effects on the cardiovascular and digestive systems.

# Real-world reflections

**Uncovering and addressing society's biggest health issues**

BY KRISTINA SAUERWEIN



Some of the world's most groundbreaking research on long COVID-19 can trace its origins to a 14-year-old Lebanese boy and his Commodore 64.

In middle school, Ziyad Al-Aly taught himself coding on his C64, a popular home computer introduced in the early 1980s. In high school, he solved complex mathematical equations and analyzed data using statistical applications. One day, Al-Aly decided to convert his C64's internal clock to appear on his screensaver as an analog clock. Six months later, his screensaver boasted a dial and hours-minutes-seconds hands.

The project earned him first place in a youth coding competition.

Most importantly, the C64 helped Al-Aly realize his love for solving problems.



Al-Aly also is the director of the Clinical Epidemiology Center and the head of research and development service at Veterans Affairs (VA) St. Louis Health Care System. Recently, Secretary of Veteran Affairs Denis R. McDonough recognized Al-Aly for significant contributions to VA research.

Over the decades, he has honed his digital talents. Al-Aly, MD, a nephrologist and clinical epidemiologist for the Institute for Public Health at Washington University School of Medicine, has become a leading COVID-19 researcher by tapping into big data and turning around studies within three to six months.

As director of the Clinical Epidemiology Center and head of research and development service at the Veterans Affairs (VA) St. Louis Health Care System, Al-Aly sifts through de-identified medical records of more than 10 million people in a database maintained by the U.S. Department of Veterans Affairs, the nation's largest integrated health-care delivery system. This technique complements other important, but time-intensive, methods of scientific inquiry. Harnessing existing data and publishing findings in near-real time helps to inform public health and policy.

Using the federal data, Al-Aly's research has found that people who have been infected with SARS-CoV-2 are at higher risks of developing

long-term — and potentially deadly — heart, brain, kidney, gastrointestinal and mental health problems compared with those who have not. Overall, people face significantly increased risks of organ failure and death within six months to a year after COVID infection. Post-COVID, people are also 40% more likely to develop Type 2 diabetes. That risk triples if they are hospitalized or admitted to the intensive care unit.

Additionally, Al-Aly's research has shown that: COVID-19 is five times more likely than the flu to cause adverse health conditions; experiencing repeat COVID infections increases the risk of organ failure and death; and receiving vaccinations doesn't shield those with breakthrough infections from developing long COVID.

His findings on long COVID have been published in top medical journals, such as *The New England Journal of Medicine*, *Nature* and the *Journal of the American Medical Association*, cited more than 10,000 times and featured in major media outlets, including *The New York Times*, *The Washington Post*, *The Atlantic*, *CNN*, *BBC* and dozens more.

Several of his studies on long COVID have generated exceptionally high public and media engagement, ranking in the top 100 of more than 23 million research papers, according to Altmetric, a firm that monitors public engagement in academic research.

The White House took notice, appointing Al-Aly as co-chair of a committee tasked with developing the national research action plan on long COVID. He also advises the World Health Organization (WHO) and governments in the United Kingdom, Canada and other countries.

“Ziyad is at the forefront of extracting insights from massive databases,” said Harlan Krumholz, MD, a cardiologist, professor of medicine and director of the Center of Outcomes Research at Yale University. “He has leveraged complex and enormous data generated through clinical practice at the Veterans Administration to produce some of the most impactful epidemiological research. His work provides a real-world reflection of patient experiences, the effectiveness of treatments and opportunities to improve outcomes.”

## ‘The gravity of war’

The oldest child of teachers, Al-Aly’s youth was clouded by the religious civil war that dominated Lebanon from 1975 to 1990 — basically from the time Al-Aly was 2 years old until he began college. The family lived in a high-rise in Tripoli, in northern Lebanon, where “luckily for us, there was less fighting than in Beirut,” Al-Aly said. “But we weren’t without conflict.”

Once bombings started near their home, Al-Aly’s mother would take her three kids out of school to shelter in their building’s carpeted basement that doubled as a movie theater. Other children from the high-rise also sought safety there. “As kids, we didn’t understand the danger,” Al-Aly said. “We thought it was great fun. We didn’t have school or homework. We ran around and played. But that’s what my parents wanted: To shield us from the gravity of war.”

Worse than war, in Al-Aly’s mind, was his dad’s myeloma, a bone marrow cancer. “My dad was hospitalized frequently, and I vividly remember visiting him after school,” Al-Aly recalled.

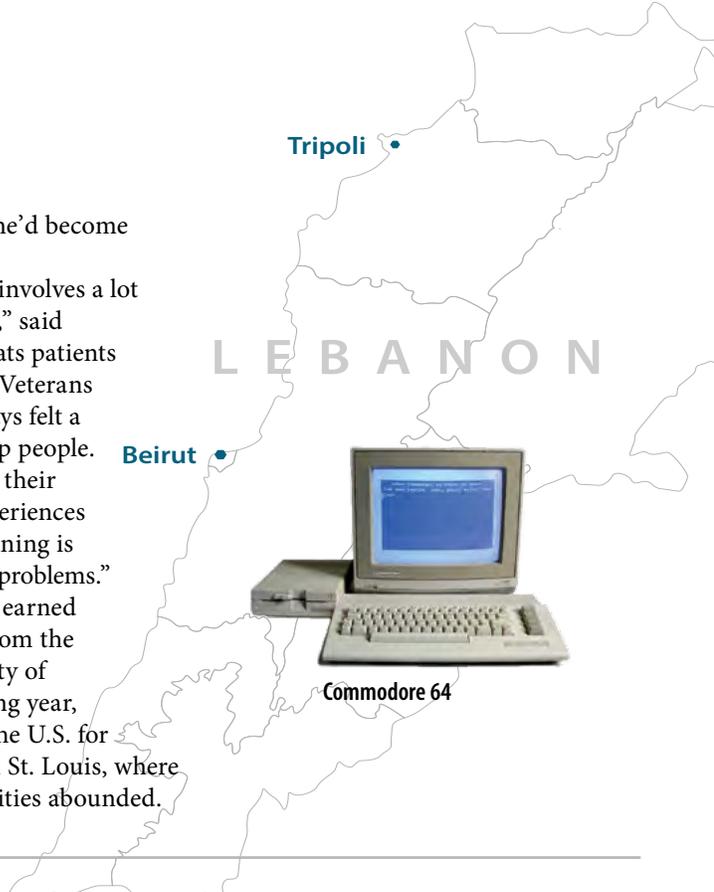
Al-Aly was 16 when his dad died in February 1990.

“The doctors who cared for my dad showed me that medicine is about helping people and easing suffering,” he said. “They represented hope.”

Al-Aly decided he’d become a physician, too.

“Being a doctor involves a lot of problem-solving,” said Al-Aly, 49, who treats patients at John J. Cochran Veterans Hospital. “I’ve always felt a strong desire to help people. My friends told me their troubles. These experiences taught me that listening is essential to solving problems.”

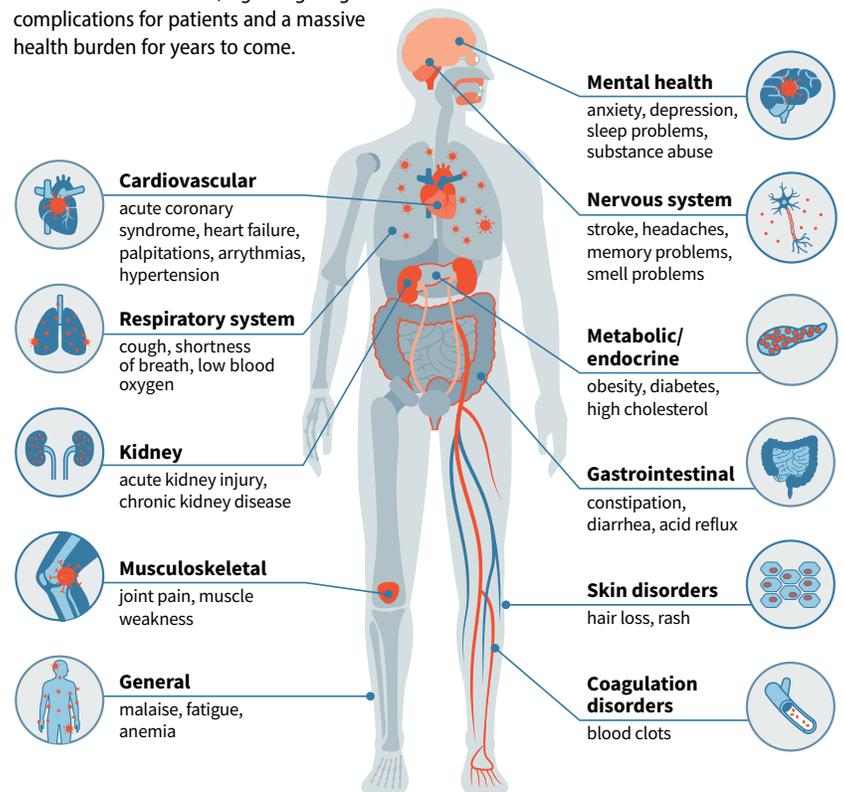
In 1999, Al-Aly earned a medical degree from the American University of Beirut. The following year, he immigrated to the U.S. for medical training in St. Louis, where scientific opportunities abounded.



## COVID-19: Lasting impact

Even those survivors with mild initial cases can have wide-ranging health issues for six months or more.

WashU researchers have linked many diseases with COVID-19, signaling long-term complications for patients and a massive health burden for years to come.



He left his Commodore 64 in Lebanon. “So many memories,” Al-Aly said. “But it wasn’t feasible to bring it to the states. With immigration, you leave one life behind and embrace the beauty and challenges of a new life.”

## A collision of serendipity

Al-Aly’s love for clinical care, coding and data analysis collided serendipitously.

While a research fellow at Washington University, Al-Aly was on a J-1 visa, which allows grantees to stay in the U.S. for five years. Al-Aly’s mentor suggested he apply for a federal government job to facilitate acquiring a green card and U.S. citizenship. A few months later, in 2006, he became a kidney doctor and researcher at the VA St. Louis Health Care System, which has been affiliated with Washington University since 1946. Al-Aly is one of 120-plus School of Medicine physicians from numerous specialties who treat more than 70,000 veterans annually in the St. Louis region.

“I immediately knew VA data was special, an integrated and immense system,” Al-Aly recalled. “I would soon realize that the VA is the best place in the U.S. for data science at such a rigorous level.”

What distinguishes the VA database is its vastness, a one-stop shop that allows researchers inexpensively to capture health information such as medical diagnoses, labs, medications, behavioral habits and sociodemographic factors such as age,

sex and ethnicity. While most veterans are older white men, the database includes millions of women and non-white people. With such a large population base, Al-Aly said statistical modeling can ensure parity in representation.

“The VA’s data is a national treasure that has helped us address important questions in near real-time,” he said. “It is a gift.”

Like his Commodore 64, the VA’s gift of big data has guided Al-Aly’s career.

## Thousands of excess deaths

Yan Xie, PhD, MPH, was inspired to join Al-Aly’s team in 2014 because of his mentor’s approach to research: Listen to patients and the public to determine their concerns. Identify the problem. Use data to address it comprehensively and conclusively.

“Dr. Al-Aly dives into urgent health issues facing society — not just the scientific society, but the public at large,” said Xie, a senior clinical epidemiologist. “We approach our research with social responsibility. It’s why we work so hard. No one works harder than Dr. Al-Aly.”

Pre-COVID, Al-Aly conducted research on the effectiveness and adverse outcomes of commonly used medications including proton pump inhibitors (PPIs), a popular class of heartburn drugs sold under brand names such as Prevacid, Prilosec, Nexium and Protonix.

More than 15 million Americans have prescriptions for PPIs, which provide relief by reducing gastric acids. Millions more purchase the drugs over the counter without being under a doctor’s care.

Al-Aly and his team analyzed de-identified medical records to identify veterans who had been prescribed PPIs and examined their health over a 10-year period. In 2016, he published his first PPI study, linking long-term use of heartburn drugs to chronic kidney disease. He later published research associating PPIs with adverse effects on the heart and digestive systems.

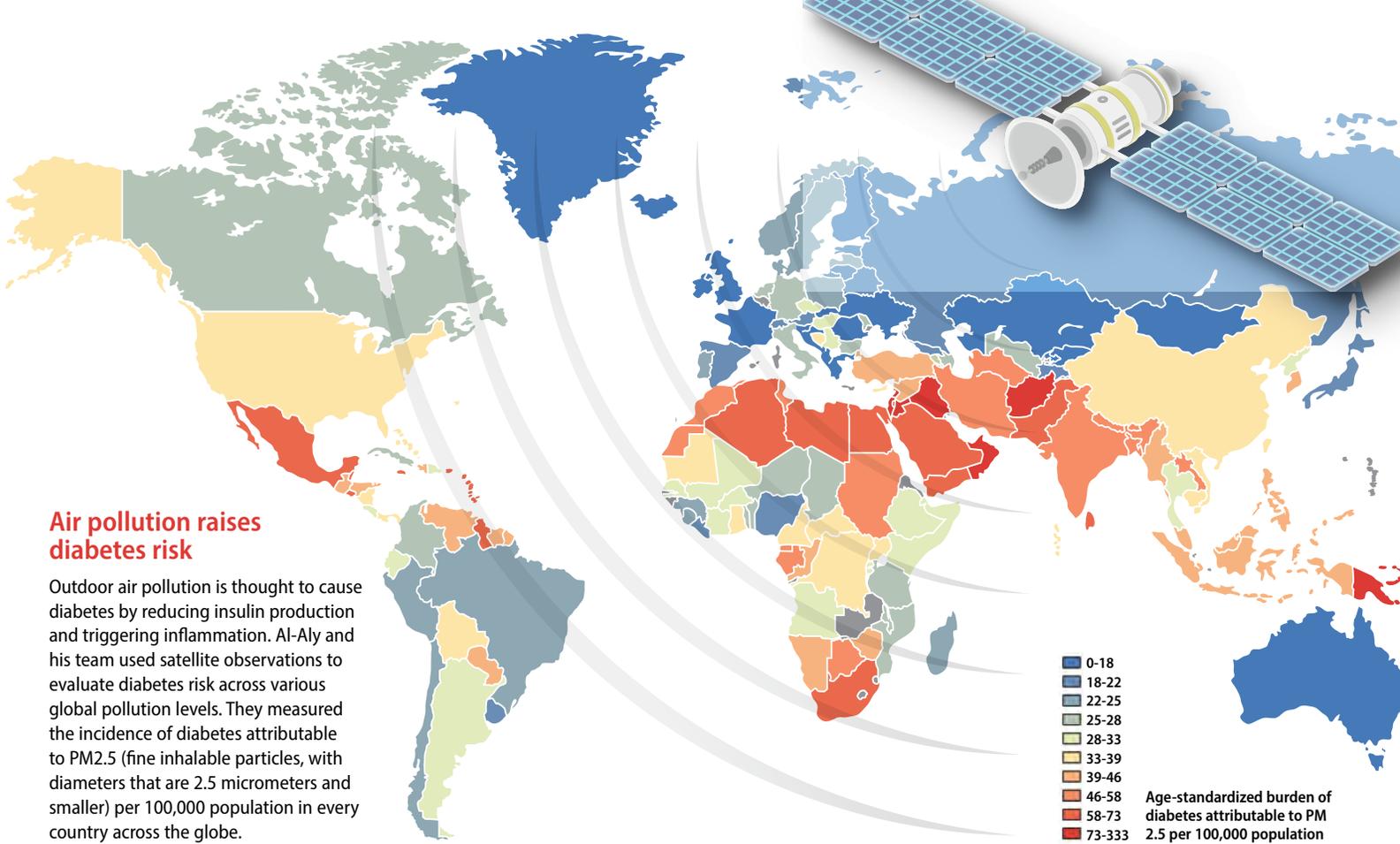
His landmark PPI study, published in *The BMJ* in May 2019, connected heartburn drugs to fatal cases of cardiovascular disease, chronic kidney disease and upper gastrointestinal cancer. Al-Aly’s team found that such risks increase with the duration of PPI use, even when taken at a low dose.

“This translates into thousands of excess deaths every year,” Al-Aly explained.

Al-Aly meets with a team of researchers to discuss the long-term consequences of COVID-19 on the heart.



MARY-DALE AMISON, PUBLIC AFFAIRS, VA ST. LOUIS HEALTH CARE SYSTEM



The study mushroomed into a major news story, with media from The New York Times, CNN and NBC News courting his expertise. A news release about the study on the WashU School of Medicine website was the first to hit more than 1 million page views.

Listening to his patients, Al-Aly discovered another major concern: diabetes.

One of the fastest growing diseases, diabetes affects more than 30 million Americans, particularly people from poorer neighborhoods or countries who lack access to nutritious foods, recreational centers and health care. An unhealthy diet, sedentary lifestyle and obesity are among the major causes.

Al-Aly's analysis of 1.7 million U.S. veterans with no history of diabetes revealed another significant driver: outdoor air pollution.

Pollution is thought to cause diabetes by reducing insulin production and triggering inflammation, preventing the conversion of blood glucose into energy needed to maintain health. "Prior research has suggested a possible link between pollution and diabetes, however, ours established a definitive link and quantified the relationship," Al-Aly said about the study, published in *The Lancet Planetary Health* in 2018.

Al-Aly and his team devised statistical models to evaluate diabetes risk across various

pollution levels. In addition to the VA records, the researchers culled data on particulate matter, airborne microscopic pieces of dust, dirt, smoke and soot from the U.S. Environmental Protection Agency (EPA), NASA and the Institute for Health Metrics and Evaluation.

The findings linked air pollution to 3.2 million new diabetes cases globally in 2016.

"We found that pollution poses a higher risk of diabetes even at low levels of air pollution currently considered safe by the EPA and the WHO," Al-Aly said.

## Communicating science

When the pandemic arrived in early 2020, Al-Aly had no idea he'd been preparing for it his whole career. He called his research on PPIs and pollution "a training ground" for the 22 studies he has since published on COVID-19.

Conducting big-data research gave Al-Aly the experience to zero in on a topic, hone analytic techniques and engineer study designs — all within a short time frame. He's learned to speak and write about science crisply and simply. He has emphasized data visualization to convey statistical



Al-Aly and team members distill complex science concepts into clear, compelling data to help inform the general public and policymakers. Using data visualization, with careful attention to detail and color, they convey statistical outcomes — such as in this high-dimensional rendering showing increased risk (red) of long COVID in nearly every organ system.

outcomes. “I pay attention to detail, color and proportions,” Al-Aly said. “Whether it’s a chart, graph or sentence, the content of my research papers needs to tell a clear story so the general public and policymakers can be informed.”

At first, Al-Aly felt nervous talking with the media. Now he’s used to it. On average, he’s interviewed about 10 times a week. After he publishes a COVID study, the number can increase to 10 times a day. Once, he spoke, emailed and Zoomed with 15 reporters in a single day.

“Had the pandemic hit 10 years earlier,” Al-Aly said, “I wouldn’t have had the confidence to quickly wield such a massive amount of data, conceptualize statistical models and then explain it in lay language to media outlets worldwide.”

## A legacy of chronic diseases

Once the U.S. went on lockdown in March 2020, Al-Aly felt the call of service. He treated COVID patients in intensive care units and, despite exposure, has yet to test positive for COVID. As a public health role model, he religiously wears masks.

He also rallied his researchers on Zoom. “We barely knew anything about SARS-CoV-2,” Al-Aly said. “But we wanted to help.”

Occasionally, Al-Aly heard talk among patients and physicians about lingering symptoms after a COVID recovery. Then, on April 13, 2020, he read a New York Times article about young, healthy people, post-COVID, plagued by coughs, shortness of breath, brain fog and other symptoms.

Through online research, he discovered the Patient-Led Research Collaborative, an international support group of biomedical researchers, policymakers and data analysts who have experienced long COVID. Many have been dismissed by doctors.

But Al-Aly immediately activated his team to conduct multiple studies on long COVID.

“Ziyad was one of the first researchers to take actionable steps based on our experiences as patients,” said Hannah Davis, the group’s co-founder. “He has produced some of the earliest and most comprehensive research on long COVID. Ziyad helped to change clinical care by showing doctors that long COVID is a real condition, not just something in patients’ heads.”

In January 2023, Davis helped publish a study estimating that long COVID affects at least 65 million people worldwide.

At Washington University, Al-Aly has led grand rounds on identifying and treating patients with long COVID. His studies also have influenced the School of Medicine’s Post COVID-19 Clinic, which offers a multidisciplinary approach to caring for long COVID.

“Dr. Al-Aly’s work has been monumental in understanding the clinical manifestations after COVID-19 infections and informing patients to recognize their own symptoms,” said Gayathri Krishnan, MD, an instructor of medicine and a fellow in medical education who leads the Post COVID-19 Clinic. “His findings on long-term brain and heart conditions after COVID-19 have helped us evaluate and better care for our patients.”

Additionally, Al-Aly’s research has served as the foundation for long COVID guidelines issued by the Centers for Disease Control and Prevention and other global government entities.

“Long COVID is leaving a legacy of chronic diseases,” Al-Aly said. “Health systems and governments need to be prepared for the long-lasting consequences for patients, health systems, life expectancy and economic productivity. Addressing challenges posed by long COVID will require economic investments and a coordinated, long-term global response strategy. So far, that is lacking.”

Al-Aly recommended the federal government create a data center to generate evidence in near real-time to help address future challenges. “It would be a huge missed opportunity if we go through this pandemic without learning from it,” he said.

His reasoning harkens back to the months he spent as a teenager trying to create an analog clock on his computer: “Thinking deeply, my Commodore 64 represents my lifelong passion for solving scientific problems.” □

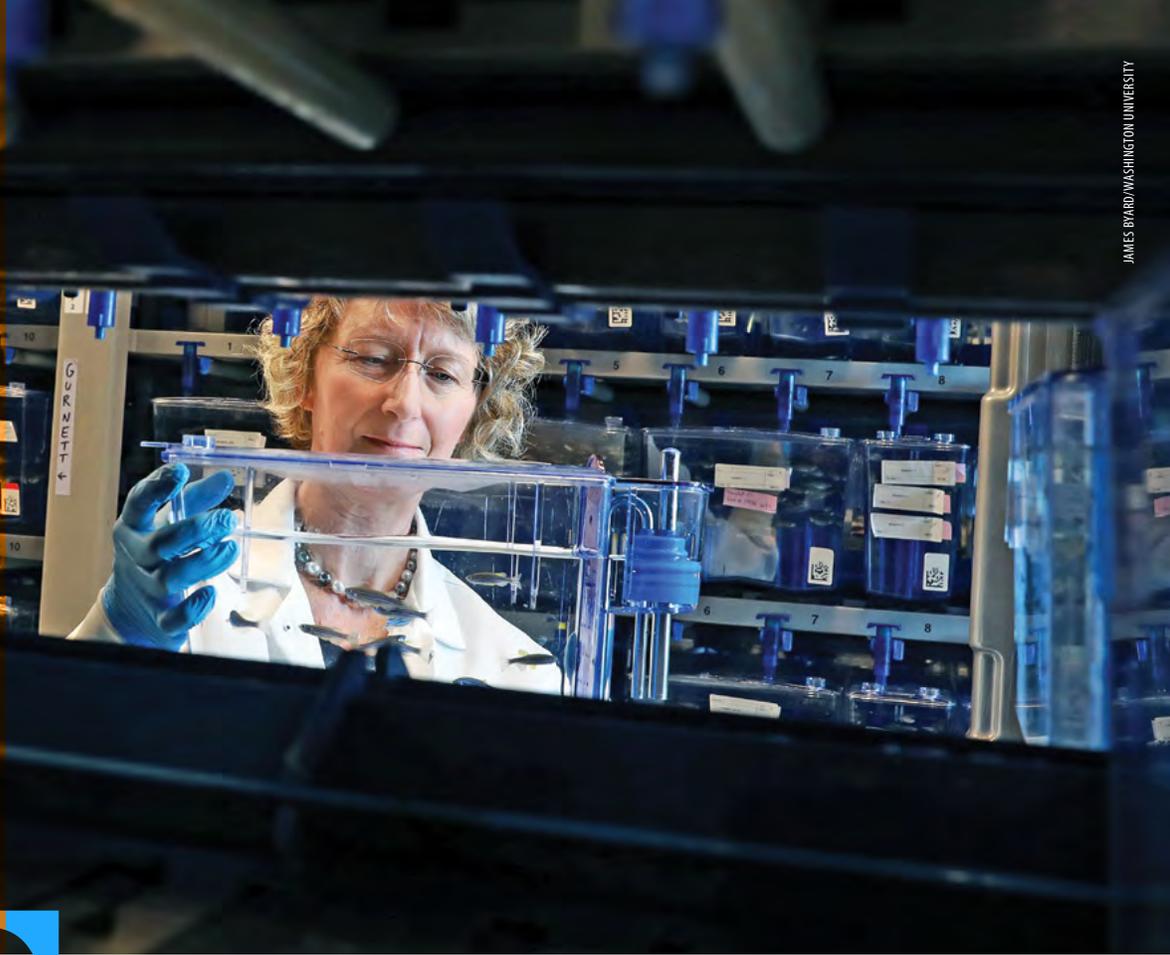
# ACHIEVING GENDER EQUITY *in medicine*

BY JEANNETTE COOPERMAN



**1<sup>st</sup> female department head**

Lilianna Solnica-Krezel, PhD, made WashU Medicine history in 2010 as the first female department head. She leads the Department of Developmental Biology.



**F**ifteen years ago, Lilianna “Lila” Solnica-Krezel, PhD, interviewed to lead a new Department of Developmental Biology, a reinvention of the WUSM Department of Pharmacology. She remembers thinking, on her flight home, that she had met 30 leaders and only two were women. But clearly the school was poised for change, and, in 2010, she made history, becoming the school’s first female department head.

In early meetings with the department faculty, Solnica-Krezel sensed how much support and autonomy she would have. “On some issues, we want to be democratic. On others, we want you to listen,” they told her, “but then we would like you to make a decision.” And so she began, engaging everyone in a democratic way, then charting a course. WUSM now has one of the most respected developmental biology departments in the nation.

Just 13 years ago, it was rare for a woman to become a full professor at a medical school, let alone hold an endowed professorship or chair a department. As the Adolphus Busch Professor of Medicine and chair of the Department of Medicine, Victoria J. Fraser, MD, also has done all three. And she has watched the medical school’s total percentage of women faculty grow higher every year.

There are still more men holding faculty positions at the School of Medicine — women make up about 42% of the faculty — but that gap has been steadily closing. The share of women

faculty rose 31% in four years, from 2016 to 2020. And though there are still only half as many female division chiefs as male, the share of female chiefs rose by 160%.

In 2010, there were 78 women full professors; by 2020, there were 159. In 2010, only 11 women held endowed professorships; by 2022, the number had increased to 61.

“There’s been dramatic change,” Fraser said. “But we must continue to update policies and procedures to ensure equitable recruitment, retention and promotion of women at WUSM.”

In 1995, WUSM’s entering class was 51% female, reaching gender parity for the first time; last year’s entering class had 65 women and 59 men. The same shift has taken place nationwide, but often, for systemic reasons, the number of women in leadership still lags behind.

Some women have left academic medicine nationally — because of inequities in pay and recognition, harassment, a lack of female role models, or policies too rigid to accommodate family life. Those who stayed sometimes were promoted more slowly. Historically, policies have valued activities more commonly found in male roles and undervalued teaching, mentoring and committee service often disproportionately assigned to women. Pregnancy, childbirth and greater responsibilities related to child care also lead to disparities in grants and publications between women and men.

“When a woman is derailed for any number of reasons, we also may lose women that they would go on to mentor, so it becomes somewhat exponential,” said Gwendalyn J. Randolph, PhD, the Emil R. Unanue Distinguished Professor of Immunology.

## Putting heads together

The problems are systemic — and systems can be fixed, points out Dineo Khabele, MD, the Mitchell & Elaine Yanow Professor of Obstetrics & Gynecology and the head of that department. “You put in goals, policies, procedures, people who can solve really difficult problems. Then we have common ways of operating that are transparent. And if something is not working, we put our heads together.”

David H. Perlmutter, MD, the George and Carol Bauer Dean of the School of Medicine and executive vice chancellor for medical affairs, intends to make that collaboration easier. He set up a leadership committee on diversity and inclusion, focusing its members on campus climate, hiring and employment culture, curriculum design and delivery, and professional training. Then he recruited Sherree Wilson, PhD, into a new leadership position: associate vice chancellor and associate dean of diversity, equity and inclusion.

Wilson and others are building on years of work. In 2002, Diana L. Gray, MD, professor of obstetrics & gynecology and of radiology, became the associate dean for faculty affairs, charged with increasing diversity and creating an environment in which faculty could thrive. Gray oversaw a gender equity committee (GEC) that broke precedent by advocating to the school’s faculty senate that it pass an amendment allowing the

pausing of the tenure clock (a probationary period for early investigator-track faculty lasting between six to 10 years). With this amendment, faculty could request that their clock stop for one year, without negative consequences, to handle personal needs, such as child-raising or elder care.

Gray and the GEC soon learned that only three of the 125 School of Medicine endowed chairs at that time were held by women, so she and a male GEC co-chair set to work.

“We found out which endowed chairs were sitting empty,” Gray recalled. “Then we asked those department chairs, ‘Are you aware that there are only three WUSM endowed chairs held by women?’ Most were not. They were stunned. Sure enough, within 15 months of this awareness campaign, we had gone from three women in endowed chairs to nine.”

Gray also instituted salary equity surveys. Other medical schools were not yet engaged in such work. These surveys, often done with assistance from outside consultants, are time-consuming and costly. The results gave department chairs concrete information about pay inequities that then could be addressed. In 2019, a report by the Association of American Medical Colleges (AAMC) highlighted WashU as a model, praising its extensive data collection, robust study methodology and diverse task force. Today, school leadership works with departments annually to address outliers in pay.

Now, with the help of Catalyst, an external consulting group, a new Executive Faculty Task Force on Climate and Culture will spend the next months gathering personal experiences and hard data, identifying any aspects of the academic environment that could be viewed as gender discrimination or sexual harassment. The task force is led by Dineo Khabele, Renée Shellhaas, MD, the David T. Blasingame Professor and associate dean for faculty promotions & career

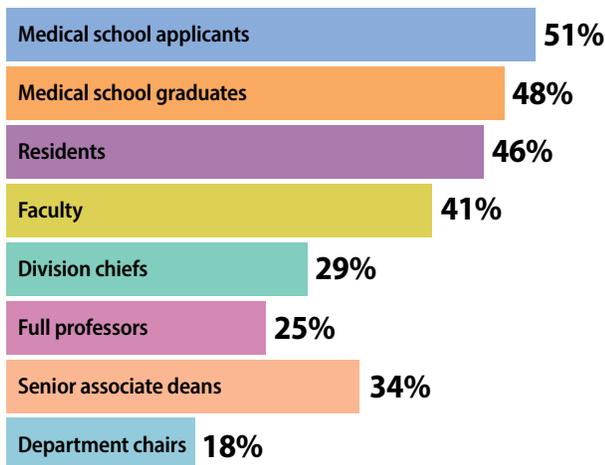
*“When a woman is derailed for any number of reasons, we also may lose women that they would go on to mentor, so it becomes somewhat exponential.”*

— Gwendalyn J. Randolph, PhD



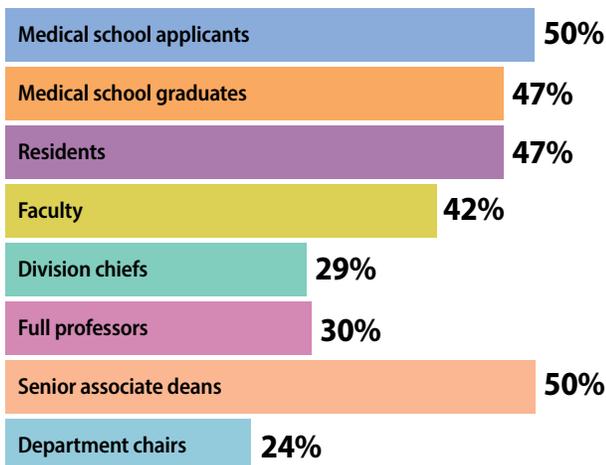
## The state of women in academic medicine nationally ...

Though women have continued to enter and graduate from medical school in similar proportions to men since 2003, women make up a majority of faculty only at the instructor rank, according to a 2018-19 report from the Association of American Medical Colleges (AAMC). Previous editions of this report were released annually, but the AAMC is exploring releasing the report in five-year increments to better illustrate demographic changes.



## ... and at WashU Medicine

There are still more men holding faculty positions at the School of Medicine — women make up 42% of the faculty — but that gap has been steadily closing. Despite dramatic change, leaders are continuing to scrutinize policies and procedures, looking for any obstacles that might put women at a structural disadvantage.



development, and Benjamin Garcia, PhD, head of the Department of Biochemistry & Molecular Biophysics and the Raymond H. Wittcoff Distinguished Professor. Meanwhile, faculty leaders continue to scrutinize policies and procedures for anything that might put women at a structural disadvantage. “We now realize,” Fraser said, “some basic things that felt right a while ago” — like limiting awards to early-career stages when women might be pausing their research to start a family — “have unintended consequences that can disadvantage women and faculty with children.”

STEM institutions are honeycombed with individual labs and other small, secluded environments that “may be susceptible to undue influence by individuals in positions of power or authority, particularly as it relates to trainees,” Fraser said. “We need to ensure that all of our clinical, research and educational environments reflect WashU values and promote equity and inclusivity so that everyone can thrive.”

WashU’s new SAFE (Supporting a Fair Environment) reporting system is an important mechanism that provides confidential reporting and robust investigation and feedback, “but we also need to train everyone to speak up and be allies in the moment,” she said.

## Networks are there to catch you

Randolph remembers the relief she felt when another woman joined her department at a previous medical school. Both were having kids at the same time, so they shared practical tips, but they also felt an instant understanding with each other.

Today, Randolph is president of the Academic Women’s Network (AWN), an independent body of female faculty at the medical school that promotes gender equity, advocacy and support. Linda Pike, PhD, the Alumni Endowed Professor of Biochemistry and Molecular Biophysics, cofounded AWN in 1990. She had been the only woman in her department for years.

“It was a restricted existence, because you didn’t have a friend where you could go plunk down in their office and ask for advice,” she recalled. “Male colleagues were concerned about being alone in the room with you. Nobody knew how this was all supposed to work.” In part because of AWN’s advocacy, the medical school created an office of faculty affairs and shined a spotlight on issues of pay equity and need for



better child care, family leave and mentorship. The school also brought on an ombuds office.

In 2014, Fraser invited the women residents in the Department of Medicine, along with women faculty, to her home, then asked them what they were experiencing and what they needed. Rakhee Bhayani, MD, professor of medicine, said the younger women's answers opened her eyes, too. She cofounded and now directs the organization that emerged from that meeting: the Forum for Women in Medicine (FWIM). FWIM provides career development workshops, leadership training and sponsors visiting women professors to share their journeys with women faculty, fellows, residents and students. Nearly always, a career that looked like a smooth ascent had plenty of hurdles.

Networking raises awareness of the subtleties, like “untitling,” added Bhayani. “All the men are addressed as Dr. So-and-so, and the women are introduced by their first name.” Or their ideas are talked over or appropriated at a meeting — until someone deftly inserts, “I like the way you built on Dr. Jenny Smith’s point... .”

## Expanding the circle

Because she was part time and doing clinical work, not research, Bhayani assumed she would remain at the instructor level. It took advocates who recognized her ability to ultimately get her promoted to full professor.

It also takes advocacy to increase the number of women nominated for prestigious awards,

pointed out Renée Shellhaas, a professor of pediatric neurology. “It’s an easy fallback to just say the women aren’t senior enough yet. But if we search for the accomplished, underrepresented individuals, they exist. They just might not be on the shortlist. Sometimes it’s hard to break into that circle.”

Coaching can give women the confidence to set an adequate budget when they write a grant, navigate difficult conversations and speak up for themselves, highlighting their accomplishments. “You can’t just have it on paper,” Gray said. “You have to trumpet it — even if you think that makes you look unfeminine. Because if you can’t be heard or seen, you’re not going to advance. People go into medicine or science thinking their record will speak for itself, and that’s partially true, but those who are the best at promoting themselves get the earliest, highest advancement.”

“Don’t allow others to define you,” advises Solnica-Krezel, the Alan A. and Edith L. Wolff Professor. “Don’t allow others to tell you what’s exciting, what’s important. Make your own decisions.”

That sort of mentoring is an important first step, but what women also need, sometimes even more urgently, is sponsorship. “Sponsors are people who advance your career, and you may not even know they’re doing it,” Fraser said. “They advocate for your skills and accomplishments” — which can mean higher compensation, a promotion, more leadership, more recognition.

Bottom line, Shellhaas said, “We need to be proactive for our junior and midcareer faculty. Are people putting their name in the pool

## 1st Black department head

Dineo Khabele, MD (right), is head of the Department of Obstetrics & Gynecology. When appointed in 2020, she also became the first Black department head at WashU Medicine.



## 1st woman to lead a clinical department

Victoria J. Fraser, MD (center), became head of the Department of Medicine in 2012. She was the first woman to lead a clinical department.

sponsoring other men, she added, “We need to teach our leaders to recognize that.” And the system needs to acknowledge the time and energy both mentoring and sponsorship require.

“There are many strong, effective leaders at this institution who create safe environments where people thrive,” said Lynn A. Cornelius, MD, professor and division director of dermatology. Unfortunately, there still exist pockets — not many, she added — where leaders put up barriers without even realizing it.

One way to minimize those barriers, Bhayani said, is by “getting buy-in from male allies in key leadership positions. Men are still the majority in leadership roles, and sometimes a man just hears it differently from another man. We have great leaders in our department who have stepped up. They’re willing to be vulnerable and say, ‘I didn’t know this either, but I learned about it, and now that I know, this is how I will handle it.’”

when the right opportunity comes up? Are we having discussions about what the next step in their career will require?” If men are unconsciously drifting toward

## The scales are weighted

Extra support often is necessary, because in the early years of a career, biology still tilts the scales. Rachel Kalbfell, a second-year med student who just finished a term as co-president of the American Medical Women’s Association, brainstorms with her three female roommates: “We have friends getting married and having kids already. When’s going to be the right time for us? I’m thinking of a surgical specialty . . .”

She has a mentor who achieved “all of it” really young — career success, marriage, two children. Ironically, she did so by not trying to do everything. “Prioritize,” she told Kalbfell firmly. “If you don’t want to cook a four-course dinner every night, sign up for meal deliveries. If you want to be the person who gets the kids ready in the morning, prioritize that.” Kalbfell chuckled. “She used the word ‘outsourcing.’”

More men are co-parenting and sharing the domestic workload, but “pregnancy, postpartum, breastfeeding — those are big demands,” Fraser pointed out. “WashU has done a lot: building more lactation rooms throughout the campus and expanding resources for child care, sick-child care and elder care.”

When younger women ask Khabele about work-life balance, she answers bluntly: “There is no balance. There is prioritization at different points in your life.”

“Everyone needs to realize it’s a temporary period of your life,” Randolph added, “and helping you get through that is really important.” When a new mother slid a resignation letter onto her desk, Randolph wadded it up. Then they talked things through, and with support, the woman made it through. “Now she is tenured, and she’s loving her lab.”

## A changing landscape

Today’s students are aware of the presence of women leaders and have access to their wisdom and experiences. Nancy K. Sweitzer, MD, PhD, professor of cardiology and vice chair of medicine for clinical research, attended medical school in the ’80s: “All my lecturers were white men, and the deans and department chairs were, too,” she recalled, “and the male attending physicians would be commenting on the female medical students’ attractiveness.”

Randolph remembers comparing her job search to that of male colleagues when her previous department in New York dissolved: “I had more grants, citations and papers than some of these men, but they were getting offers three times better than mine.” She interviewed at several high-profile institutions, she added, where “a woman would close her door and say, ‘You really don’t want to come here.’” One said, “My husband is also a scientist, and when I went up for tenure, they wanted to know if he wrote my grants.”

Later, when Randolph was the one steering a search committee, she heard men say of female candidates, “She smiles too much” or, “She seems like a bitch.” Sweitzer remembers one man pushing for a particular candidate with the words, “He just looks like a chair.”

Today, those words would freeze a room.

## Next steps

In her new position, Shellhaas will further coach leaders to “work against the implicit biases we all carry.” The Office of Diversity, Equity & Inclusion also provides leadership, advocacy, education and training on implicit bias.

Shellhaas is now leading efforts to clarify the process and expectations for promotion across academic tracks and roles — clinicians, educators, research track and investigator/tenure-track faculty.

That means, “if someone has been at their academic rank longer than usual, reaching out to them,” she said. “It could be that they’re very happy and we don’t need to change anything. Or it could be that they are stuck, and we need to figure out why. Do they need different mentors, different skill sets, clarification of expectations? Some people don’t even realize they already meet the criteria for promotion, or they just need one or two more elements to be ready.”

The emphasis on inclusion is making recruitment and retention easier. “Steps are being taken so that women are valued at this institution, and this will hopefully translate into more empowerment and positions of leadership for younger women,” Cornelius said.

Moving more women into leadership will help foster gender equity research, too. More needs to be learned about reproductive health for Black women, Khabele pointed out. And it is probably not a coincidence, Sweitzer said, that only 4.5% of interventional cardiologists are female, and we know far less about cardiovascular diseases that affect women.

“If we want to do our very best for the patients we serve and for the health of the community, we need to tap into the best and brightest talent we have — no matter the gender,” Shellhaas concluded. “We would be crippling ourselves if we didn’t.” □

*“Steps are being taken so that women are valued at this institution, and this will hopefully translate into more empowerment and positions of leadership for younger women.”*

— Lynn A. Cornelius, MD





Alumna Lindley Wall, MD, examines the arms, wrists and hands of Alexander Trudo, 9, at St. Louis Children's Hospital. Wall is the inaugural holder of the Jacqueline N. Baker and W. Randolph Baker Professorship in Pediatric Orthopaedics.

Couple funds  
endowed  
professorship

KRISTI RUGGLES

## Fueling progress in orthopedic surgery

Jackie Neibert was introduced to the School of Medicine research enterprise in the early 1970s, when she was hired as an administrative assistant to the head of what is now the Department of Cell Biology & Physiology.

During her time in the department, she met and married Randy Baker, then a young Anheuser-Busch executive.

In early 1977, Jackie became pregnant and subsequently displayed a handful of inexplicable symptoms. That October, she prematurely delivered twin daughters who were transferred to the St. Louis Children's Hospital neonatal intensive care unit (NICU) for extended stays.

The tenacity and expertise that the care team displayed for Jackie and the couple's twin daughters resonated. Later, the couple also sought care from physicians in the Department of Orthopaedic Surgery. Both underwent hip replacement and rehabilitation due to arthritis pain and loss of mobility. Ultimately, the couple developed a deep appreciation for — and philanthropic interest in — the scientific investigation that drives exceptional patient care.

“As we got to know the physicians, we learned about their research interests and pioneering work and wanted to support where we felt it could make an impact,” said Randy, who retired from Anheuser-Busch in 2008.

The Bakers' initial gifts were focused on neonatology in the form of an endowed neonatal neurology fellowship and endowed funds named for their five grandchildren to support therapy programming for neonatal patients. They later provided crucial funding for the formation of Washington University's Living Well Center, which offers a multidisciplinary, lifestyle-centered approach to treating musculoskeletal disorders and other acute and chronic conditions. More recently, they established an endowed fund for the Living Well Center and a separate fund for its COVID-19 long-term program.

The Bakers also have contributed important financial support for orthopedic research and clinical care. Their gifts have accelerated the study of hip preservation and replacement and established a fellowship for advanced training in orthopedic clinical research.

Their most recent gift — a \$2 million contribution to endow the Jacqueline N. Baker and W. Randolph Baker Professorship in Pediatric Orthopaedics — will further enhance the Department of Orthopaedic Surgery's national reputation. The National Institutes of Health (NIH) already ranks the department among the best-funded orthopedics research centers. The department's residency program is rated No. 3 by Doximity, and U.S. News & World Report consistently recognizes the Division of Pediatric and Adolescent Orthopaedic Surgery as one of the top programs in the nation.

Despite the department's prestigious profile, it has not had a dedicated pediatric orthopedics professorship. Such positions are powerful tools for recruiting and retaining world-class faculty members who drive research innovations and train future leaders in medicine, said department head Regis J. O'Keefe, MD, PhD, the Fred C. Reynolds Professor of Orthopaedic Surgery.

In addition, income generated from professorship endowments can be used to bolster recipients' clinical and research programs.

“An endowed professorship in pediatric orthopedic surgery was one of the most critical needs we had,” O'Keefe said. “As is so often the case with the Bakers, they saw a need and stepped up to meet it. This gift will keep the department at the forefront of pediatric orthopedic care.”

## Forward-thinking philanthropists

The inaugural recipient of the Baker Professorship is Lindley B. Wall, MD, professor of orthopedic surgery, member of the department's hand and microsurgery service and chief of the Division of Pediatric and Adolescent Orthopaedic Surgery. Wall earned a medical degree at Washington University in 2006. She also completed an orthopedics residency at the university in 2011 and earned a master's degree in clinical investigation in 2017. She is a national leader in the treatment of pediatric hand and upper-extremity congenital deformities and spasticity conditions.

“I am excited and honored to be named the first Baker Professor,” Wall said. “This recognition is meaningful to me personally and professionally. It inspires me to work harder to elevate care for our pediatric patients and their families.”

The Bakers hope Wall and future recipients of their professorship will further the field of pediatric orthopedic surgery and advance discoveries that could improve the lives of their grandchildren and, of course, children they will never meet.

“St. Louis is stronger because of Washington University School of Medicine,” Jackie said. “And health care far beyond St. Louis is better as a result of the work done here.”

Charles A. Goldfarb, MD, is professor and executive vice chair of orthopedic surgery and Wall's predecessor as chief of pediatric and adolescent orthopedics. He has come to know and appreciate the Bakers as one of Jackie's physicians and through the couple's partnership with the School of Medicine. He describes them as forward-thinking philanthropists.

“Their support has made it possible for the department to provide care that is really ahead of its time,” he said. “Their generosity will allow us to continue moving the needle in the field of orthopedics.”



**Jackie and Randy Baker**

MATT MILLER

Jeffrey P. Henderson, MD/PhD (right), has conducted several research projects with Longer Life Foundation (LLF) grants. Here, he and graduate student George Katumba investigate biomarkers that will help identify COVID-19 patients at high risk for severe disease.

# Helping people live *longer, better lives*

Foundation celebrates  
25 years of supporting  
innovative research

BY CONSTANCE GIBBS

**A**s a young School of Medicine faculty member rounding on patients, Jeffrey P. Henderson, MD/PhD, observed an increase in recurrent urinary tract infections (UTIs) among hospitalized older adults, who experience a high rate of UTI complications. If there was a way to identify the biomarkers of a severe infection, he theorized, at-risk patients could be treated earlier and more effectively, leading to better outcomes.

Seeking to gather preliminary data, he applied for and received a seed grant from the Longer Life Foundation (LLF), a unique collaboration between Washington University School of Medicine and St. Louis-based Reinsurance Group of America Incorporated (RGA). “It was a valuable opportunity for someone like me, who was just starting out and needed to get a foot on the first step,”

said Henderson, now an associate professor of medicine and of molecular microbiology, who specializes in infection pathogenesis with a special focus on UTIs.

His study, completed in 2014, revealed that differences in urinary pH and metabolite composition determine whether an important immune protein is able to inhibit bacterial growth. That work led to additional studies suggesting new therapeutic and diagnostic strategies for recurrent UTIs and other bacterial infections.

“The grant helped me to ask the right questions, gather resources and develop methods,” Henderson said. “That support during our team’s early investigations allowed us to show other funders we had an idea worth exploring.”

This year, the foundation is celebrating 25 years of funding groundbreaking research into the drivers of mortality and morbidity. Since its founding in 1998, the foundation has supported 146 projects, awarding \$8.3 million to study genomics, obesity, older-age cognition, heart disease, cancer and more.

## A novel pairing

“The Longer Life Foundation is a wonderful philanthropic effort by RGA to support young scientists and more established researchers as they move their investigations into new areas,” said Dominic N. Reeds, MD, professor of medicine and director of the Longer Life Center, the foundation’s administrative arm on the Medical Campus. “Science is not free. These researchers receive support at a critical point when it’s the difference between being able to conduct the research or not.”

The foundation was the brainchild of A. Greig Woodring, former president and chief executive officer for RGA, and the late William A. Peck, MD, former executive vice chancellor for medical affairs and dean of the School of Medicine. They believed a partnership focused on longevity-

related research would benefit public health, clinical medicine and the insurance industry. The researchers would receive funding for studies with the potential to advance human health. And insights from this research could help the life and health insurance industry more accurately assess applicants and provide cost-effective coverage.

“Pairing an academic institution with the insurance industry was a novel idea that hadn’t happened before,” said Daniel D. Zimmerman, MD, managing director of the Longer Life Foundation and senior vice president and chief science adviser for RGA. “The relationship between Washington University and the Longer Life Foundation is truly remarkable because the world-class research taking place is improving health and wellness for many people. The ability to live a healthy and fulfilling life is important for everyone.”

Each year, six to eight researchers receive one-year grants of up to \$50,000 from the Longer Life Foundation. They can apply for a second year of funding based on their findings. Recent awardees represent departments across the university.

Many of the pilot and feasibility studies funded by the foundation have provided proof of concept that has enabled researchers to secure additional grants to continue their work, some more than 10 times the amount of the foundation’s initial investment. More than 170 articles citing foundation support have been published in peer-reviewed scientific journals.

Zimmerman acknowledged that not all projects are successful. “We know that some experiments might fail or prove the null hypothesis or that they might be the first step in a multitude of steps to get to a certain point,” he said. “We give investigators the ability to fail or succeed in small increments. That’s how science works, and we want to support investigators on the journey of discovery.”

In addition to funding, researchers receive mentorship and support. “We advise investigators at all stages of their projects to keep them engaged and ensure their success,” said Bradley A. Evanoff, MD, MPH, chair of the Longer Life

## Longer Life Foundation impact

- **Founded in 1998**
- **146 research projects**
- **\$8.3 million granted** to study genomics, obesity, older-age cognition, heart disease, cancer and more



MATT MILLER

**LLF funding supported Jennie Kwon, DO, an infectious disease physician, in her efforts to understand the fecal microbiome of patients who have developed multidrug-resistant urinary tract infections.**

## Longer Life Foundation (LLF)

grants provide the means for researchers to sow the seeds of their ideas.



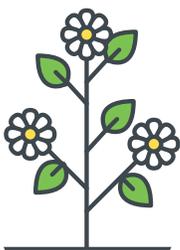
### Initial investment

Scientific investigations, like seedlings, flourish best when planted in rich soil. These grants help novel ideas take root.



### Research

LLF grants fund research time, lab equipment/supplies and more, providing a solid framework for researchers to pursue their work.



### Results

The groundbreaking discoveries from LLF-funded investigations already have and will continue to yield longer, healthier lives.



MIT MILLER



MIT MILLER

Grant recipient and nutritional scientist Samuel Klein, MD (right, with research assistant Freida Custodio), conducted studies into obesity.

(Left) LLF grants enabled cardiovascular physician-scientist Kory J. Lavine, MD/PhD (left, with cardiology instructor Jesus Jimenez, MD/PhD), to research pediatric dilated cardiomyopathy, the most common indication for heart transplantation in children.

Foundation scientific review committee and the Richard A. and Elizabeth Henby Sutter Professor of Occupational, Industrial and Environmental Medicine at the university.

Mentorship starts with the application process. The foundation hosts orientation sessions, where researchers can gather feedback on their plans before submitting a formal proposal. Those whose projects are not funded have the opportunity to receive additional feedback and are encouraged to reapply.

## Increasing collective success

Evanoff meets regularly with grant recipients to identify challenges and provide needed resources. That includes connecting researchers who have similar interests and experiences. “WashU faculty members are eager and willing to share information and techniques to help others succeed,” said Evanoff, who also serves as assistant vice provost for Washington University and as director of the Division of General Medical Sciences in the Department of Medicine. “Our faculty recognize that the achievements of our

colleagues often create new opportunities and increase our collective success.”

In its role as the interface between the foundation and Washington University, the Longer Life Center organizes and hosts research seminars, grand rounds, guest speakers and other activities for the research community. The center also secures clinical specialists to provide updates and continuing education for insurance groups.

In the future, Zimmerman said the foundation hopes to grow its support of researchers across the university, including public health experts who could address an array of health challenges. The foundation is also interested in projects focusing on the social determinants of health, which have an important influence on health inequities.

“We’re proud of the work done through the Longer Life Foundation over the past 25 years and pleased that the foundation has grown and thrived during that time,” Zimmerman said. “We look forward to continuing our support of and collaboration with Washington University for many years.”

## Find your friends.

Classnotes are organized first by year of degree/training completion and then in alphabetical order.

## How about you?

To share your news, visit [alumni.med.wustl.edu/class-note](http://alumni.med.wustl.edu/class-note). Submissions will be printed in a subsequent issue of Outlook magazine as space allows. Photos are welcome.

### 1960s

**James Morrison, MD '65**, completed his book "DSM-5-TR Made Easy: The Clinician's Guide to Diagnosis," an extensive revision of a previous volume. It was published this spring by The Guilford Press.

**Steven Bennett Raffin, MD '68**, finally retired as "president of Shelborne HOA" after eight years but continues to be vice president of Mayers Healthcare Foundation in Fall River Mills, Calif., which is located near the Cassel, Calif., fly-fishing property he owns with his wife, **Sherry M. Raffin, LA '67**. He writes that his wife has mobility issues due to kyphoscoliosis, so he manages the household, but "otherwise, she is fine. Not much else to report except that a cigar and good book in the afternoons (outside, of course) continues to be great 'work.'"



**Emily Louise Smith, MD '68**, received honorary entry into the Evens Society in the Department of Radiology at the Mallinckrodt Institute of Radiology at the School of Medicine in September 2022 for service to the department and medical school.

### 1970s

**M. Susan (Martin) Cigelman, PT '76, EdD**, retired in 2014 following a career in physical therapy and higher education. She and her husband retired to Hot Springs Village, Ark., from Des Moines, Iowa. Cigelman was inducted into the Streator (Ill.) High School Hall of Fame in December 2021.

### 1980s

**Jon Robert Friedman, MD '84**, after 21 years with Optum, is finishing up his first year as chief medical officer of Transplant Genomics Inc., a leader in innovative post-abdominal solid organ transplant biomarkers. This was a natural next step after leading Optum's transplant and renal disease programs for the previous 10 years. Friedman is grateful this new job did not require him to move from his home in Manhattan Beach, Calif.

**Andrew G. Batchelder, MD '89**, a family medicine physician in Spokane, Wash., retired in April 2022.

### 1990s

**Jeffrey Boris, AB '87, MD '91**, has opened a private telemedicine-only practice caring for children and young adults with postural orthostatic tachycardia syndrome (POTS) and other autonomic disorders, after practicing pediatric cardiology in the U.S. Air Force, private practice and at the Children's Hospital of Philadelphia. He continues to research and has published in the POTS field and has become a prominent pediatric provider for POTS in the U.S.



**David Martin, MD/GM '92**, was elected vice president for scientific affairs of the American Society of Anesthesiologists (ASA). ASA is a 55,000-member educational, research and scientific association of physicians devoted to raising the standards of the medical practice of anesthesiology and improving patient care.



**John Edward Mason, MD '93**, and his wife, **Mary V. Mason, MD '94, HS '98, PMBA '99**, are doing very well and are still in St. Louis. They have one college graduate, one freshman in college and a sixth grader. John Mason is chief of surgery at St. Luke's Hospital in Chesterfield. Mary is founder of Little Medical School, a children's educational franchise that has inspired over 1 million children from around the world to consider careers in health care.

**Cristina Ferrone, MD '97**, has been appointed chair of the Department of Surgery at Cedars-Sinai Medical Center after an extensive national search. She previously served as professor of surgery at Harvard Medical School and director of the Office of Clinical Careers for Massachusetts General Hospital in Boston. Ferrone completed her general surgery residency at Massachusetts General Hospital, followed by a surgical oncology fellowship at Memorial Sloan-Kettering Cancer Center in New York. She earned a master's degree in clinical trial design from the Harvard/MIT Investigator Training Program. Ferrone specializes in the care of patients with complex hepato-pancreatico-biliary disorders. She has spearheaded novel minimally invasive surgical techniques and developed cutting-edge immunotherapeutic strategies for patients with cancer of the liver, biliary system and pancreas. She runs a National Institutes of Health (NIH)-funded translational research lab dedicated to discovery of novel immunotherapeutic treatments for these cancers. She leads the largest North American clinical trial for resectable pancreatic cancer.

**Vineet Arora, MD '98**, dean for medical education at the University of Chicago Pritzker School of Medicine, was named to the National Academy of Medicine. She also received the Herbert T. Abelson Professorship of Medicine at the University of Chicago in honor of Abelson, who earned a medical degree from Washington University in 1966 and received an alumni achievement award in 2001.

**Mark S. Cohen, EN '94, MD '98, HS**, moved this year from the University of Michigan, where he was vice chair in surgery and director of the medical school Innovation

and Entrepreneurship Path of Excellence, to begin his new role as dean of the Carle Illinois College of Medicine at the University of Illinois, Urbana-Champaign (UIUC), and senior vice president and chief academic officer of Carle Health. He also is a professor of surgery and of biomedical and translational sciences at Carle Illinois and recently was invested as the Founder Professor of Engineering in the Grainger College of Engineering at UIUC, where he is a professor of bioengineering. He would love to connect with classmates.



**Sukanya Pyne, DPT '06**, founded ReJenga, which works to develop sustainable rehabilitation centers supporting people with disabilities in rural areas. Pyne (center, in yellow) just visited the rehabilitation center in Panskura, India. The center provides free services to 46 children and education to about 300 people in the community through ReJenga.org.

**Ashlea Dawn (Pinegar) Cardin, MSOT '99,**



received the 2022 Dr. Corinne Walentik Leadership in Health Award. Cardin is a pediatric occupational therapist with 22 years of experience in a Level III Neonatal Intensive Care Unit at Mercy Kids Children's Hospital in Springfield, Mo. She is also a board-certified pediatrician and a certified neonatal therapist. For the past 16 years, Cardin has provided in-home, pro-bono pediatric occupational therapy services to the Amish communities in Webster County, Mo.

She serves as an associate professor at Missouri State University. The award honors the late Walentik's commitment to serving those living in the most challenging situations, specifically children. As part of the award, \$25,000 is being contributed to Cardin's charity of choice: Amish Outreach Medical Clinic in Seymour, Mo. Cardin hopes to expand the services and footprint of the Amish Outreach clinic. She also welcomes visiting physicians and students, as the clinic is an opportunity to gain experience in delivering rural health care, while serving Amish families that typically live separately.

**2000s**

**Jason David Keune, LA '97, MD '06,**



was honored to be featured in the Society of American Gastrointestinal and Endoscopic Surgeons "Member Spotlight."

**Vicki Kathleen Kaskutas, UC '00, DOT '08,** retired Oct. 1, 2022, from the position of associate professor in occupational therapy and of medicine after 25 years at WUSM and a 40-year career in occupational therapy.

## Alumni Achievement Awards

As part of Celebration Weekend, April 21-22, the Washington University School of Medicine Alumni Association recognized four Alumni Achievement Award recipients.



**Vineet Arora, MD '98,** is the Herbert T. Abelson professor of medicine and dean for medical education at the University of Chicago's Pritzker School of Medicine. She was recognized for her dedication to improving quality, equity and opportunity in academic medicine, medical education and patient care.



**Carol North, MD '83; HS '87, '90; GM '93,** retired from The University of Texas Southwestern Medical Center, where she held a joint appointment in the Department of Emergency Medicine and served as the director of the Division of Trauma and Disaster. She was recognized for her distinguished contributions to disaster mental health, psychiatric aspects of medical illness and psychosocial aspects of homeless populations.



**Audrey Rostov, MD '88, HS '92,** is director of cornea, cataract and refractive surgery and a specialist in complex anterior segment surgery at Northwest Eye Surgeons in Seattle. She is also the global medical liaison for SightLife, the world's leading eye bank and global health organization dedicated to eliminating corneal blindness. Rostov was recognized for her mentorship and dedication to cornea care training in lower- and middle-income countries.



**Richard Wahl, MD '78; HS '82, '83,** is the Elizabeth E. Mallinckrodt Professor of Radiology, director of the Edward Mallinckrodt Institute of Radiology and the chair of the Department of Radiology at Washington University School of Medicine. He was recognized for his distinguished contributions to education, research and leadership in nuclear medicine and nuclear oncology.

Read about the 2023 awardees and submit nominations for the 2024 awards at [alumni.med.wustl.edu](http://alumni.med.wustl.edu).



# William A. Peck: A tribute

Expanded Medical Campus, led School of Medicine to new heights in 14 years as dean

**W**illiam A. Peck, MD, former executive vice chancellor and dean of Washington University School of Medicine, died peacefully, surrounded by family, Wednesday, Feb. 22, 2023, at his home in St. Louis County, Mo. He was 89.

The first to hold the positions of both executive vice chancellor and dean at the university, Peck also served as president of Washington University Medical Center during a span when the School of Medicine became one of the nation's leading centers for medical research and academic clinical practice, as well as one of the most selective medical schools.

*“He was a deeply admired mentor, and a lot of our stature as a medical school can be attributed to that.”*

— David H. Perlmutter, MD

Peck elevated the school’s stature over his 14-year tenure as dean — recruiting top researchers, educators and staff; fostering collaboration among those on his leadership team; and raising the school’s research profile in genetics, neurodegenerative disease and basic science.

Under his leadership, the university opened the Center for Advanced Medicine, providing state-of-the-art clinical and outpatient surgical space for the school’s rapidly growing Faculty Practice Plan. The building houses Washington University outpatient clinics and operating rooms and includes the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine, launched in 1999, also during Peck’s tenure.

After stepping down as dean, Peck established the Center for Health Policy (now the Center for Economics & Health Policy) at the university’s Institute for Public Health and became a national leader in health policy, particularly in the areas of rising costs, disparities in care access,

workforce shortages and errors and inefficiencies in providing medical care.

“Bill could have been eminently successful in a dozen walks of life — business, finance, music and anything that requires skills with people,” former chancellor William H. Danforth, MD, said as Peck was preparing to step down as dean in 2003. “Luckily, he chose medicine and Washington University.”

The school honored Peck with the creation of the Peck Scholars program, which provides merit- and need-based scholarships to medical students. Peck embraced the program, and he and his wife actively and generously supported it.

David H. Perlmutter, MD, executive vice chancellor for medical affairs, the George and Carol Bauer Dean of the School of Medicine and the Spencer T. and Ann W. Olin Distinguished Professor, lauded Peck for deftly leading the school through a tremendous period of growth.

“Bill Peck was at the helm at a time when the School of Medicine was on



the precipice of growth and change, on multiple levels,” Perlmutter said. “He had a knack for inspiring physicians and scientists. He led the effort to establish a comprehensive cancer center, and it was his vision that started the faculty practice plan that is now Washington University Physicians, both of which are now among the most impactful clinical programs in the nation. His sensibility about the community led to expansion of redevelopment efforts in nearby neighborhoods and a bolstering of the role of the medical school in essential safety net clinical care. He was a deeply admired mentor, and a lot of our stature as a medical school can be attributed to that.”

Peck also was a physician-scientist, known for his research on bone and mineral metabolism. Focusing on the understanding and treatment of osteoporosis, he developed the first method for directly studying the structure, function and growth of bone cells and determined mechanisms by which hormones regulate bone function. Peck was the founding president of the National Osteoporosis Foundation.

**William A. Peck, MD, shown earlier in his career, made significant contributions to the field of medicine, especially to the understanding of bone diseases.**



WASHINGTON UNIVERSITY

William A. Peck, MD, gives a keynote speech during a School of Medicine Commencement ceremony.



WASHINGTON UNIVERSITY

He was born in New Britain, Conn., where his father, Bernard, was a general practitioner, maintaining a medical office adjacent to the family's home. At age 7, Peck contracted osteomyelitis, an infectious inflammatory disease of the bone, and underwent surgery for the life-threatening illness. His experience helped spur him to pursue a career focused on bones and bone metabolism.

He earned a degree in biochemical sciences from Harvard College in 1955 and a medical degree from the University of Rochester School of Medicine in 1960. Then, he completed two years of residency training in internal medicine and a one-year fellowship in metabolism at Barnes Hospital. He served for two years as a clinical associate at the National Institutes of Health (NIH).

In 1963, he became chief resident at Strong Memorial Hospital at the University of Rochester, and eventually was named a professor of medicine and biochemistry and the head of endocrinology.

In 1976, he was appointed the John E. and Adaline Simon Professor of Medicine and co-chairman of the Department of Medicine at Washington University, as well as physician-in-chief at Jewish Hospital of St. Louis. He became vice chancellor for medical affairs and dean of the School of

Medicine in 1989 and was named executive vice chancellor in 1993. When he stepped down from his leadership role, he was named the Alan A. and Edith L. Wolff Distinguished Professor in the Department of Medicine.

He was also a gifted pianist and often performed at School of Medicine and alumni functions. Several years ago, he released a CD. The back cover read: "Dr. Peck usually plays a Steinway, sometimes plays a Yamaha Concert Series, occasionally plays a weighted Hammond, and in his spare time, doctor."

Peck is survived by his wife, Patricia Hearn Peck; their blended family of children, David Peck, Edward Peck, Kate Peck Nelson, Andrea Harbin Niehoff, Elizabeth Harbin and Katy Hinkley; and two grandchildren, Joey Niehoff and Jaki Nelson.

A public memorial service was held May 23 at Graham Chapel on the Danforth Campus.

Memorial contributions may be made to the Peck Scholars Program at the School of Medicine: Washington University c/o Advancement Services, MSC 1082-144-2555, 1 Brookings Drive, St. Louis, MO 63130.

## Paul Berg, Nobel Prize-winning biochemist, 96



Paul Berg, a former associate professor of microbiology at Washington University School of Medicine and a winner of the Nobel Prize in

chemistry, died Wednesday, Feb. 15, 2023, at his home on the Stanford University campus in Palo Alto, Calif. He was 96.

Berg won a Nobel Prize in 1980 alongside Walter Gilbert and Frederick Sanger for their studies of the biochemistry of nucleic acids. Berg was the first person to construct a recombinant DNA molecule — a molecule containing parts of DNA from different organisms — by inserting DNA from one virus into another. His work led to the development of genetic engineering, a powerful approach that has transformed medicine and agriculture.

Berg came to Washington University School of Medicine in 1954 as a research fellow and instructor to study enzymes under Arthur Kornberg. Kornberg would go on to win the Nobel Prize in Physiology or Medicine in 1959 with Severo Ochoa for their discovery of the mechanisms in the biological synthesis of RNA and DNA.

In Kornberg's lab, Berg discovered a previously unknown class of biological compounds involved in the synthesis of biomolecules. Berg became an assistant professor of microbiology at Washington University in 1955 and was promoted to associate professor in 1957. In 1959, he moved to Stanford University to help Kornberg set up a new biochemistry department.



**Jennifer Miller, Siteman media and marketing administrator, 33**

Jennifer Anne Miller, a media and marketing administrator at Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine, died Jan. 17, 2023, during a surgery in Bethesda, Md., to treat a rare, advanced cancer. She was 33.

The mother of two young children, ages 4 and 1, Miller was diagnosed in August with stage 4 adrenocortical carcinoma. She was treated at Siteman before undergoing surgery at the National Institutes of Health in Bethesda.

In her role at Siteman, Miller successfully implemented an award-winning social media strategy and most recently developed a marketing plan for the pediatric cancer program, Siteman Kids. She was noted for her positive energy and her compassion for patients and their families.

Miller began working at Siteman in 2015, deepening what was already a commitment to helping people with the disease. Her mother, Kathleen Anne Baudendistel, died of cancer in 2006, after which Miller organized an annual event dubbed “Kathy’s Crazy Christmas Bus” to honor her mom and raise funds for Siteman and other organizations.

She is survived by her husband, Kyle Miller; their children, Grady and Tess Miller; her father, Bill Baudendistel; her brothers, Matt and Dan (Jill) Baudendistel; grandparents Louise McDaniel, Betty Baudendistel and Bob Miller; in-laws, Pam and Jeff Miller; a brother-in-law, two nieces and several aunts, uncles and cousins.

Memorial contributions may be made to Siteman Cancer Center, 7425 Forsyth Blvd., St. Louis, MO 63105, or online at [siteman.wustl.edu/tribute](http://siteman.wustl.edu/tribute). Please indicate the gift is in memory of Jenny Miller.



**Joseph L. Roti Roti, professor emeritus of radiation oncology, 79**

Joseph Lee Roti Roti, PhD, a professor emeritus of radiation oncology at Washington University School of Medicine, died Saturday, Feb. 18, 2023, at his home in Highland, Ill. He had been dealing with kidney-related conditions and was 79.

Roti Roti joined Washington University in 1985 as chief of the cancer biology section and an associate professor of radiology at the School of Medicine’s Mallinckrodt Institute of Radiology. Two years later, he was promoted to professor. In 2001, he became director of the cancer biology division in the school’s newly established Department of Radiation Oncology.

Roti Roti’s major areas of interest were the cellular response to ionizing radiation, cell-cycle progression, and the effects of heat shock and of radio-frequency radiation. Among his most noted research contributions, he showed that heat shock caused altered binding of nuclear proteins, inhibiting DNA repair and DNA replication. He also conducted what was believed at the time to be the most comprehensive single study of the potential effects of radiofrequency radiation from cellphones.

In 2010, he was named a professor emeritus of radiation oncology.

In addition to his passion for research, he was a master naturalist and loved astronomy and photography.

He is survived by his wife, Patricia Roti Roti; his siblings, Anne (Thomas) Saal, Mary (Douglas Rogers) Roti Roti, Donna (Alan) Resetar, Elizabeth (Bill) Hendrick and Jon (Marjorie) Roti Roti; his stepchildren, Meaghan (Chris) Meyer, James (Melissa) Gansmann, Lori (Dave Moreland) Gray, and Kelly (Ken Cope) Nessel; his grandchildren, Lauren and Taylor Gray, Sierra Nessel, Joey Gansmann and Matthew, Patrick and Caroline Meyer; and several nieces, nephews, great-nieces and great-nephews. His first wife, Stephanie Pagano (nee Kestranek), died in 2006.

**1940s**

**Martha H. Conway**, NU '48; August '22

**Harry S. Jonas Jr.**, LA '49, MD '52, HS '56; December '22

**William T. Mathes Jr.**, HS '49; September '22

**1950s**

**Robert E. Hermann**, MD '54; January '23

**Lawrence Kahn**, HS '51; October '22

**Lawrence C. Pakula**, MD '57; November '22

**Gerald L. Smith**, MD '51, HS '54; December '22

**1960s**

**James R. Boatright**, MD '66; November '22

**Beverly Jean (Baptist) Monical Hays**, PT '60, MHA '72; December '22

**Wylie C. Hembree III**, MD '64; December '22

**Bradner Hisey**, MD '63; August '22

**Richard Taylor Moore**, MD '60; January '22

**1970s**

**Gordon N. Gephardt**, MD '71; September '22

**John E. Zweig**, DE '72; September '22

**1980s**

**Michael R. Green**, MD/PhD '81; February '23

**1990s**

**Julia Bussom Carico**, OT '92; November '22

**In Memoriam**

To view past In Memoriam listings or to submit an obituary for publication, visit [alumni.med.wustl.edu](http://alumni.med.wustl.edu).



## *Rockin' and rollin' and what not*

**M**edical student Bianca Robison, as Sandy, and Judson Ellis, as Danny, (top, foreground) dance during a dress rehearsal of the musical "Grease." For more than 15 years, students from all School of Medicine programs have worked together to produce, choreograph and perform an annual Broadway-style musical. While shouldering heavy academic and clinical responsibilities, the students have explored theatrical passions — taking all the parts, playing all the instruments, building all the sets and making all the costumes.

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*“You have completed this first stage of your medical training under conditions none of us could have predicted, and you have not only survived but you have thrived.”*

— Anthony S. Fauci, MD, in his Commencement address



Guest speaker Anthony S. Fauci, MD, responds to a lengthy standing ovation at the MD Commencement ceremony May 15. The recently retired director of the National Institute of Allergy and Infectious Diseases encouraged medical school graduates to stand up for science and truth, and to never forget one's humanity in helping patients.