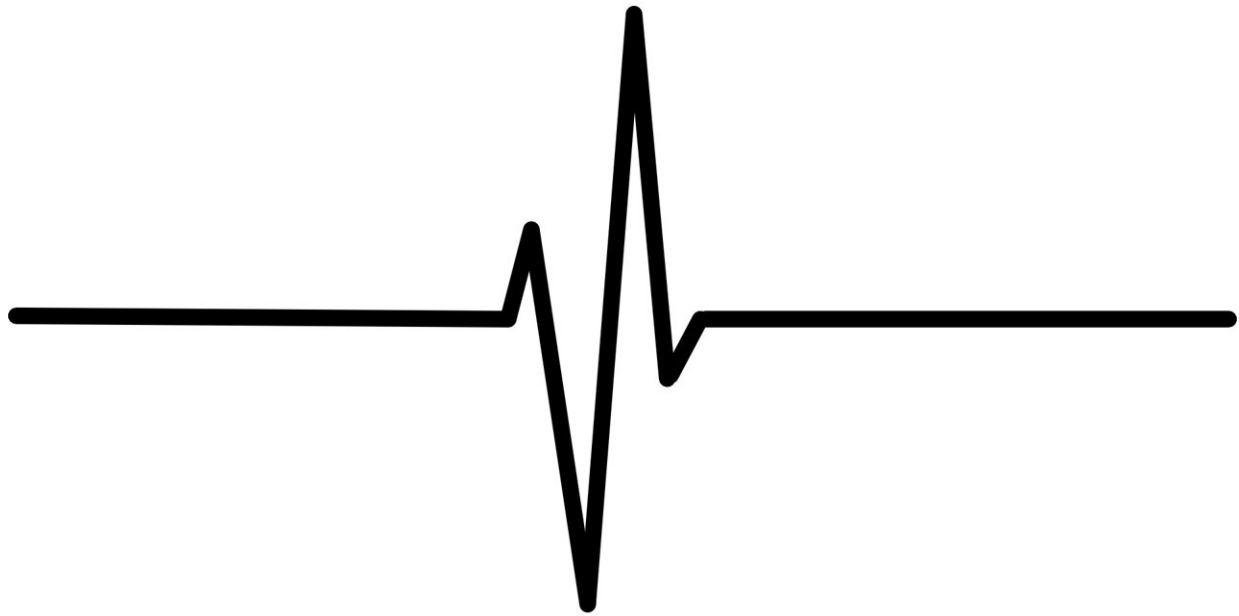


Century of progress sets stage for future scientific advances in cardiovascular health

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Dramatic advances in the understanding and treatment of cardiovascular diseases have saved millions of lives in the 100 years since the founding in 1924 of the American Heart Association (AHA). As heart disease and stroke remain the top causes of death worldwide, the solutions to challenges of the next century must combine lessons of the past with innovations of the future, according to "The American Heart Association at 100: A Century of Scientific Progress and the Future of

Cardiovascular Science—A Presidential Advisory," [published](#) in *Circulation*.

The advisory is the first ever written exclusively by current and past volunteer presidents of the AHA. The advisory writers present the historic journey of the Association over the past century and outline potential challenges and opportunities for the coming years.

Additionally, the advisory issues a call to action for the medical and scientific community to join with public and private stakeholders to accelerate initiatives in research, [clinical care](#) and [public health](#).

These steps are needed to ensure a future of optimal patient care, science and research integrity and advancement, health equity for all and, ultimately, a world free of cardiovascular diseases and stroke.

"Scientific research that identifies causes, prevention, diagnosis and treatment of cardiovascular diseases is a foundational pillar the American Heart Association was built on in 1924. The evolution of this science since 1924 has led to remarkable achievements in prevention and therapy of heart disease and stroke—essentially cutting heart disease death rates by more than half (70%) from 1950 to 2021 and stroke deaths rates by nearly a third since 1998," said advisory writing committee chair Mitchell S.V. Elkind, M.D., M.S., FAHA, who was the volunteer president of the AHA in 2020-21.

"As our understanding of cardiovascular diseases has evolved, so has the way we've carried out our mission, which now encompasses not only the prevention of disease but also the active promotion of ideal cardiovascular health."

Elkind, who is currently on staff as the Association's chief clinical science officer, noted that the AHA is a global leader in advancing cardiovascular science and medicine.

"Through funding for research grants, publication in [scientific journals](#), convening of educational meetings, development of clinical practice guidelines and membership networking and mentoring opportunities, the Association provides invaluable support to the scientific community around the world," he said.

"Armed with a century of research, the Association has made significant efforts in state and federal advocacy, professional and consumer education, global coalitions and collaborations and continued investment in health equity, all of which have direct impact on patients and the general public."

The advisory highlights a number of important developments that have altered the course of successfully preventing, diagnosing and treating heart disease in the past 100 years. Many of these have been made possible through the expansion of the field of cardiovascular science to include multidisciplinary teams of scientists around the world from the areas of basic, translational, clinical and population science.

"Advancements over the past century are far beyond anything the founders of the American Heart Association could imagine," said Mariell Jessup, M.D., FAHA, vice-chair of the advisory writing committee and the Association's chief science and medical officer.

"We know so much more about the molecular and cellular mechanisms of cardiovascular disease and how to treat it; we've learned how genetics can play a role in the development of disease; through advances in imaging we can look inside the body and see where clots are formed or where there are structural issues; we can perform open and closed heart surgery, bring a heart back to life through resuscitation and defibrillation and even provide people with a second chance at life through heart transplants."

"Medical technology is literally at our fingertips through smart phones and watches. Yet, despite these remarkable accomplishments, even with today's knowledge, gaps remain, particularly in ensuring health care access and quality care for people in diverse and underrepresented populations."

The establishment of population science, perhaps best represented by insights provided by the Framingham Heart Study, led to the discovery that heart disease and stroke are often caused by such modifiable risk factors as high blood pressure and cholesterol, diabetes and obesity, many of which may be reduced by healthy lifestyle behaviors or treated with medications. Yet, population science has also identified consistent disparities among certain populations, including women, as well as among different racial and ethnic groups.

"Medical treatments have come a long way and there is a lot to be said for following a healthy lifestyle. However, there are many people who do not have access to those means. One of the biggest challenges for the future will be to reduce socioeconomic barriers to health and ensure access to health care when people are sick," said Jessup, who was also volunteer president of the AHA in 2013–14.

"It is no longer enough to understand the biological mechanisms of cardiovascular diseases. Future scientific approaches must also look at the epigenetic mechanisms, those behavior and environmental interactions that may lead to the development of cardiovascular disease. That encompasses fundamental social and structural factors such as education, housing, transportation, quality of neighborhood resources, air and water quality, access to care and chronic psychosocial stress."

The writing committee noted the AHA is already at the forefront of the next explosive growth in scientific discovery.

"The increasing capacity of massive computers and cloud-based platforms to store and share data, the use of artificial intelligence, or AI, to analyze millions of pieces of complex data at once, gene editing with technologies such as CRISPR, the ability to take a person's own blood cells and regenerate them into replicas of the heart cells they had at birth—these types of advances are no longer futuristic visions, they're realities," said Joseph C. Wu, M.D., Ph.D., FAHA, current volunteer president of the AHA, director of the Stanford Cardiovascular Institute and the Simon H. Stertzer Professor of Medicine and Radiology at Stanford School of Medicine.

"They help us expand our capabilities beyond traditional research to learn more and learn faster. We can conduct what I like to call 'clinical trials in a dish' where the possibilities far exceed what we can do with individual studies of a few hundred or thousand subjects that must be conducted over the course of years."

Wu noted these new technologies will help in discovering new ways to treat heart disease, whether by new medications or new medical procedures or even by actually repairing the cardiac tissue damaged by a heart attack.

"These advances will continue to reveal the specific mutations or combinations of genetic variations that lead to individual cardiovascular diseases, and chip-based diagnostics will be increasingly used in hospitals and clinics in the not-too-distant future," he said. "With these and related technologies and those yet to be discovered, we will likely come closer to realizing the promise of precision medicine—personalized treatment specific to the individual person."

The advisory writing committee concluded that, if the next century of the AHA's lifesaving work is to be as impactful as the first 100 years, several issues must be addressed:

- Scientific literacy must be enhanced to increase public knowledge and understanding about the methods and interpretation of scientific data, including the ever-evolving, unfinished nature and the uncertainty inherent in science.
- Nontraditional approaches to health care are needed to address the social and structural determinants of health by moving evidence-based approaches rapidly into communities to address [food insecurity](#), transportation problems, education, housing, access to care, chronic psychosocial stress and other social needs, meeting people where they are.
- The interconnectedness of organ systems, mechanisms of disease and stages of life are critical to understanding the full relationship cardiovascular health plays in overall health. The increasing evidence that conditions that manifest late in life such as coronary artery disease or dementia often are initiated in childhood creates a need for increased prevention and treatment throughout the lifespan.
- Appreciation of systems of care will be increasingly important in the future to achieve significant clinical benefits. Reliance on individual physicians may not be realistic in managing diseases that involve multiple organ systems such as [cardiovascular-kidney-metabolic disease](#) or disorders affecting the heart, brain and mind simultaneously.
- More funding for research is a critical need as the pace of increases in funding has not kept up with the pace of scientific advances. Advances in the next century will likely require even greater technological investments. Laboratory experiments will likely demand more sophisticated equipment; translational science will incorporate expensive new technologies like AI; and population health will require greater computing power and larger sample sizes to realize the promise of precision medicine.

Additional challenges include the need for a stronger, more diverse

workforce across the scientific community; addressing changes in how scientific information is disseminated and published; ensuring innovative collaborations between academic, nonprofit and industry stakeholders maintain the integrity of the science; and establishing more global collaborations to connect scientists around the world. More details and specific calls to action can be found in the advisory.

In a commentary accompanying the presidential advisory, AHA Chief Executive Office Nancy Brown noted that 100 years after being founded by scientists seeking new insights into the mystery of heart disease, the Association remains squarely focused on the power of science and research to improve and extend lives.

"This century of scientific know-how means we have many proven solutions to offer," Brown said. "Our next century is a thrilling opportunity for advancing our knowledge and hopefully even defeating [heart disease](#) and stroke."

Brown proclaimed the progress of the past century will continue into the next as the AHA works alongside more than 32 million volunteers, supporters, donors and countless other collaborators around the world.

"Our future is about improving yours. Everyone can become a champion of their own heart and brain health and support healthy living in their communities," Brown said. "We encourage you to join us as we boldly carry out our mission to be a relentless force for a world of longer, healthier lives for all. Learn how at www.heart.org/centennial."

More information: The American Heart Association at 100: A Century of Scientific Progress and the Future of Cardiovascular Science: A Presidential Advisory From the American Heart Association, *Circulation* (2024). [DOI: 10.1161/CIR.0000000000001213](https://doi.org/10.1161/CIR.0000000000001213)

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