

ASU researcher on the importance of considering sex differences in health studies

By Kimberlee D'Ardenne, ASU News
November 7, 2025

It has long been understood that there are biological differences between sexes, but it has only been around a decade since federally funded biomedical research has been required to include females in the U.S.

And it is more important than ever to recognize the importance of these differences and to fully fund research on women's health, according to Arizona State University President's Professor [Heather Bimonte-Nelson](#), who has been studying female neurobiology and the impact of hormones during aging for decades.

For example, women are more likely to be misdiagnosed when having a heart attack than men. This discrepancy happens because [women experience different symptoms from men](#), such as anxiety or shoulder pain — and until a few years ago, these symptoms were not widely publicized or communicated to the medical community.

Bimonte-Nelson recently authored an [essay](#) on how sex inclusivity in science benefits all of us. She explains that science has a lot left to discover about sex differences that will be impactful to human health across the lifespan.

Question: Why is it important for basic science research and clinical research to include both male and female participants?

Answer: Studies using only males make up the majority of the biomedical literature, but sex and sex hormones affect every level of our biology, from molecules to cells to entire systems, even including overall brain structure. Innumerable scientific principles and profiles of disease manifestation, symptom presentation and sequelae¹ are based on studies performed only in males, which means female data are interpreted to be a variant arising from a male-centric gold

standard. This is inappropriate and insufficient at best. It should not be assumed that outcomes in one sex will apply to all individuals — because they do not.

Q: Does basic biology or cognition really differ across the sexes?

A: The short answer is yes.

Many developmental, neuropsychiatric, neurological and neurodegenerative disorders vary by sex in their prevalence, symptomology and progression. For example, premature female infants recover better from intracranial hemorrhage than do males; women are more likely to be diagnosed with post-traumatic stress disorder, anxiety disorders and major depressive disorders; and there is a male bias in the prevalence of autism spectrum disorders, with sex differences in symptom presentation including restricted, repetitive and externalizing behavior patterns. There are sex differences in long-term consequences of traumatic brain injury that have a distinct molecular-associated inflammatory signature. Women are nearly two times more likely than men to develop an adverse drug reaction. A report from the U.S. Government Accountability Office showed that of 10 drugs withdrawn from the U.S. market over a four-year time frame, eight of them had greater health risks in women, with the report concluding that this was driven by a lack of representation of females in the studies leading to FDA approval. Yet, the majority of drugs lack sex-specific recommendations and guidelines.

About a decade ago, the National Institutes of Health formally mandated that males and females must be considered in the design, analysis and reporting of all federally funded biomedical research. While this has been an important turning point, finding sex differences in a domain does not mean that they are well-characterized. Discovering driving mechanisms, symptomology and treatment outcomes are necessary to obtain the bigger picture and have a real impact on health and disease.

Q: What motivated you to study women's health and cognition?

A: I am driven to discover factors that impact women's health and sex differences relating to neurological functions because there is a marked knowledge gap in this domain. My lab focuses on neurological functions such as memory, depression and anxiety because they impact everyday quality of life in women.

Memory can decline with menopause, and depression and anxiety have been shown to increase during this time as well. How specific menopause types, prior hormone exposures and subsequent hormone therapies impact these outcomes have yet to be determined, but there is evidence that they each influence neurological function. My lab is working to decipher which variations of menopause and hormone exposures across the lifespan impact these brain functions and to identify the biological drivers of these effects.

Q: What do you want everyone to understand about what there is to gain from studying sex differences?

A: Sex differences are one type of individual difference that are relevant to health and disease. Female biology, anatomy and function should not be dismissed and treated as irrelevant. We will not have rigor, precision and excellence in science and medicine without accuracy, and accuracy requires an accounting of the variables that impact health and disease. The studies done to date provide indisputable evidence that sex is one of these variables. Sex differences should be studied

and embraced, and need not be a barrier to scientific discovery. Only when we embrace this source of individual variability will we have rigor, precision and excellence in science and medicine. ... When we have this, we impact all individuals.

This story originally appeared on [ASU News](#).

¹ The aftereffects of a disease, condition or injury.

Main image



President's Professor Heather Bimonte-Nelson says that science has a lot left to discover about sex differences that will be impactful to human health across the lifespan. Photo by Laura Fields/Arizona State University