



# STUDYING SEX TO STRENGTHEN SCIENCE

Studying both sexes is a guiding principle that undergirds the mission of the National Institutes of Health (NIH): turning discovery into health.

The Office of Research on Women's Health (ORWH) was established in 1990 to promote women's health research in the scientific community within NIH and beyond.

## SEX AND GENDER

Sex is a biological variable defined by characteristics encoded in DNA, such as reproductive organs. Gender refers to social, cultural, and psychological traits linked to human males and females through social context.

Sex, gender, and their interactions can all influence molecular and cellular processes, clinical characteristics, and health and disease outcomes.



Sex: genetic, molecular, cellular, physiological



Gender: behavioral, environmental, social, cultural

## STUDYING BOTH SEXES IS GOOD SCIENCE

Research on women's health is an essential part of the NIH research agenda, both in basic research in laboratories and in studies that involve people.

A 1993 law requires researchers to include women in NIH-funded tests of new drugs and other clinical trials, as scientifically appropriate. Today, more than half of participants in NIH-funded clinical trials are women. However, many researchers have overlooked the role of sex in preclinical research. Sex is an important biological variable in studying animals and cells. Because it is meant to lead to human studies, preclinical research should include both sexes to ensure that findings in the lab are relevant to humans. That's why NIH is asking scientists to consider sex as a basic biological variable.

## WHAT WE HAVE LEARNED FROM RESEARCH ON WOMEN'S HEALTH, SEX, AND GENDER

- Certain medications affect women and men differently.
- Women have a more difficult time quitting smoking than men and respond differently to nicotine replacement treatments.
- HPV vaccines protect against most cervical cancers.
- We can prevent transmission of HIV from mother to child.
- Chronic TMJ disorders, like other pain disorders, are more common in women than in men.
- Being deployed increases suicide risk for women more than for men.
- The Women's Health Initiative clinical trial had a huge return on investment and has:
  - Spared 75,000 women from heart disease.
  - Prevented 126,000 women from getting breast cancer.
  - Added 145,000 quality-adjusted life years overall.<sup>1</sup>



CELEBRATING A  
**QUARTER CENTURY**  
IN WOMEN'S HEALTH RESEARCH

<sup>1</sup> Roth JA et al. Economic return from the Women's Health Initiative estrogen plus progestin clinical trial: a modeling study. *Ann Intern Med.* 2014;160:594-602.



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## NEW NIH POLICIES

In June 2015, NIH announced that it is changing the instructions for scientists applying for NIH funding and revising the criteria for the reviewers who judge the funding applications. These changes are part of an NIH-wide initiative to improve the reproducibility of publicly funded research through increased scientific rigor and transparency. **NIH expects that sex as a biological variable will be factored into research designs, analyses, and reporting in vertebrate animal and human studies.** Scientists proposing to study only one sex will be required to provide strong justification from the scientific literature, preliminary data, or other relevant considerations. These updates will take effect for funding applications submitted to NIH in January 2016. This new policy promotes the best science by ensuring a balanced approach that can be achieved by studying both sexes in NIH-funded preclinical research.

For more information, see:

- [http://orwh.od.nih.gov/about/director/director\\_biological\\_variable.asp](http://orwh.od.nih.gov/about/director/director_biological_variable.asp)
- <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-15-102.html>
- [http://orwh.od.nih.gov/sexinscience/overview/pdf/NOT-OD-15-102\\_Guidance.pdf](http://orwh.od.nih.gov/sexinscience/overview/pdf/NOT-OD-15-102_Guidance.pdf)

## GETTING STARTED

Sex should be considered from the very earliest stage of health-related research. Here are some suggestions:

- **Add sex, gender, male, and female to the literature search on the topic of interest.**
- **Note patterns, such as a disease that skews toward one sex, that may suggest influence of sex or gender.**
- **Conduct pilot studies.**



### Consider

Design studies that take sex into account, or explain why it isn't incorporated



### Collect

Tabulate sex-based data



### Characterize

Analyze sex-based data



### Communicate

Report and publish sex-based data

## LEARN MORE

Visit the ORWH Studying Sex to Strengthen Science (S4) website, [www.nih.gov/sexinscience](http://www.nih.gov/sexinscience), to learn more:

- **Online courses on sex and gender differences**
- **Reading room of journal articles on studying both sexes**
- **NIH policy documents and references related to inclusion of women in clinical research**
- **Funding opportunities for basic and clinical research related to women's health and sex differences**
- **Videos and slides from a workshop on incorporating sex into scientific research studies**
- **A to Z guide on sex and gender influence on specific topics in health**