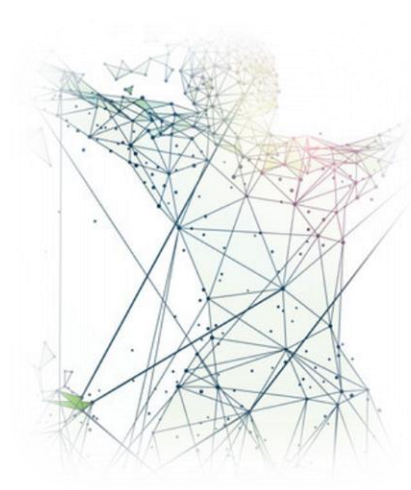




**LIFE SCIENCE ZÜRICH**  
IMPACT

# DATA FOR HEALTH

May 23rd, 2023



## **Gender Medicine: The Long and Rocky Road to Equality**

**Prof. Dr. med. Dr. sc. nat. Catherine Gebhard**

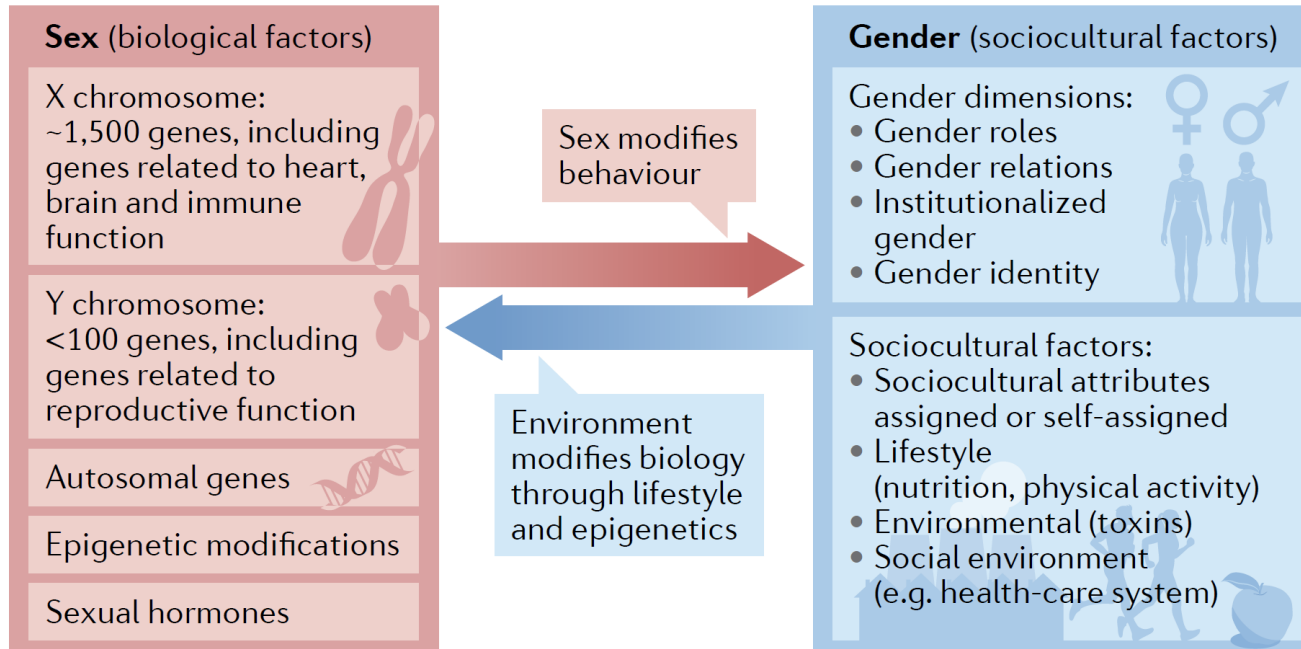
Department of Cardiology, University Hospital Inselspital Bern  
Department of Nuclear Medicine, University Hospital Zurich

# Sex AND Gender in Health and Disease



## Sex

**Biological differences such as genes, sex hormones, anatomy, and physiology**



## Gender

**Socially constructed characteristics of women and men**



# Gender Medicine & Data?



Mind the Gender Data Gap



# Gender Data Gap: Examples....



*The NEW ENGLAND JOURNAL of MEDICINE*

ORIGINAL ARTICLE

## Colchicine in Patients with Chronic Coronary Disease

S.M. Nidorf, A.T.L. Fiolet, A. Mosterd, J.W. Eikelboom, A. Schut, T.S.J. Opstal, S.H.K. The, X.-F. Xu, M.A. Ireland, T. Lenderink, D. Latchem, P. Hoogslag, A. Jerzewski, P. Nierop, A. Whelan, R. Hendriks, H. Swart, J. Schaap, A.F.M. Kuijper, M.W.J. van Hessen, P. Saklani, I. Tan, A.G. Thompson, A. Morton, C. Judkins, W.A. Bax, M. Dirksen, M. Alings, G.J. Hankey, C.A. Budgeon, J.G.P. Tijssen, J.H. Cornel, and P.L. Thompson, for the LoDoCo2 Trial Investigators\*

- **Sex differences in inflammation/immune responses are known**
- **15% women, 85% men**
- **No benefit in women (supplementary information)**

# Gender Data Gap: Examples....



*The* NEW ENGLAND JOURNAL *of* MEDICINE

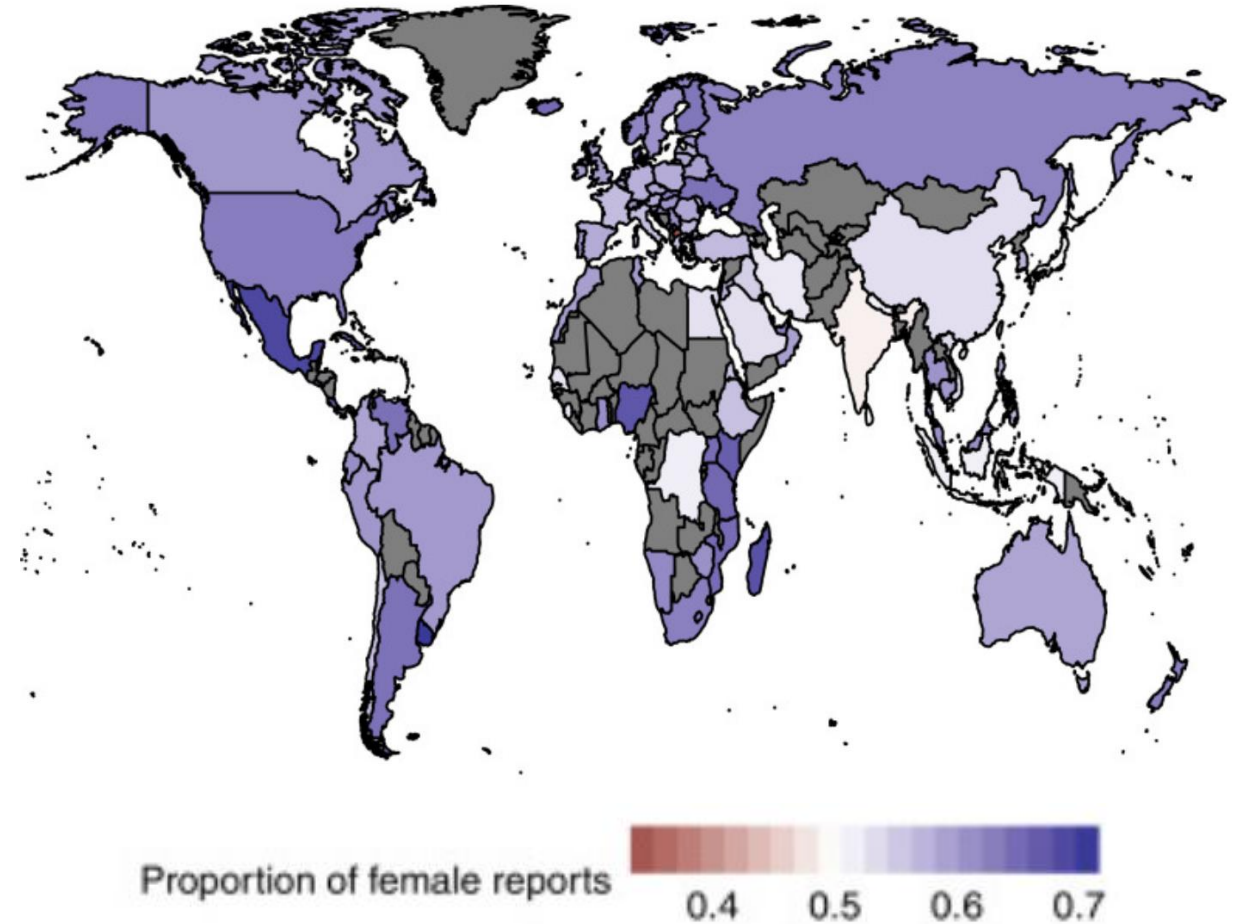
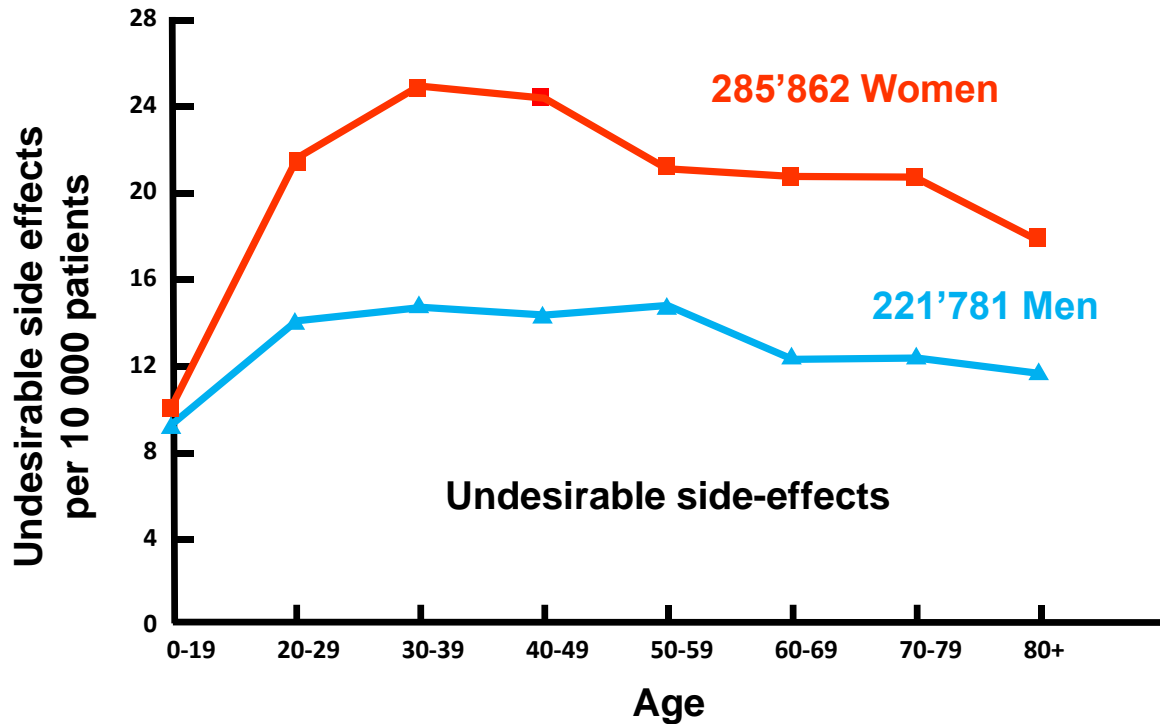
ORIGINAL ARTICLE

## Five-Year Outcomes of the Danish Cardiovascular Screening (DANCAVAS) Trial

Jes S. Lindholt, M.D., D.M.Sc., Rikke Søgaard, Ph.D.,  
Lars M. Rasmussen, M.D., D.M.Sc., Anne Mejldal, Ph.D.,  
Jess Lambrechtsen, Ph.D., Flemming H. Steffensen, Ph.D.,  
Lars Frost, M.D., D.M.Sc., Kenneth Egstrup, M.D., D.M.Sc.,  
Grazina Urbonaviciene, Ph.D., Martin Busk, Ph.D.,  
and Axel Cosmus Pyndt Diederichsen, Ph.D.

***“We performed a population-based, parallel-group, randomized, controlled trial involving men 65 to 74 years of age living in 15 Danish municipalities.”***

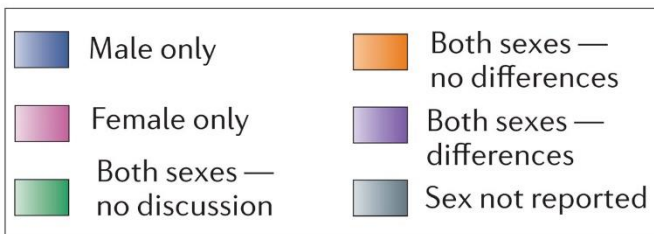
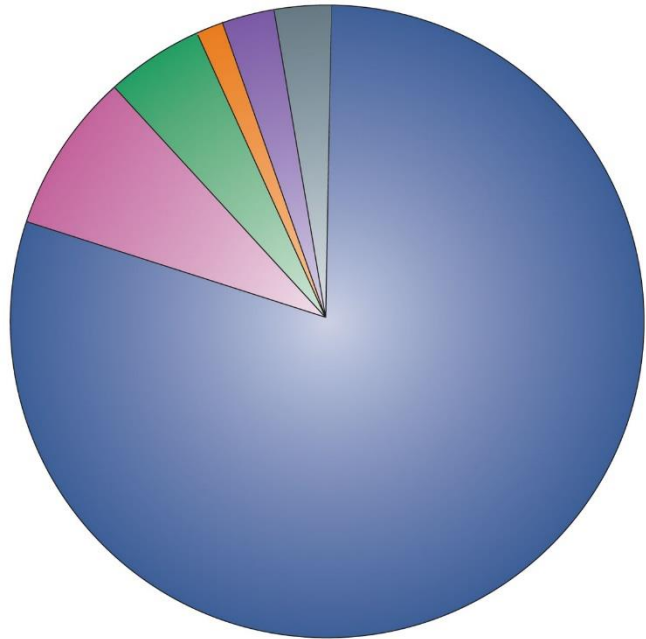
# Gender Data Gap: Impact....



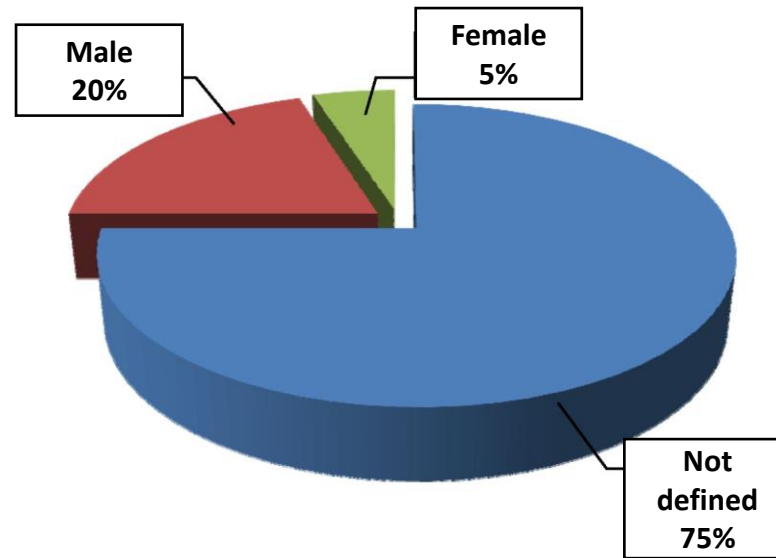
# Sex of Study Subjects and Authors



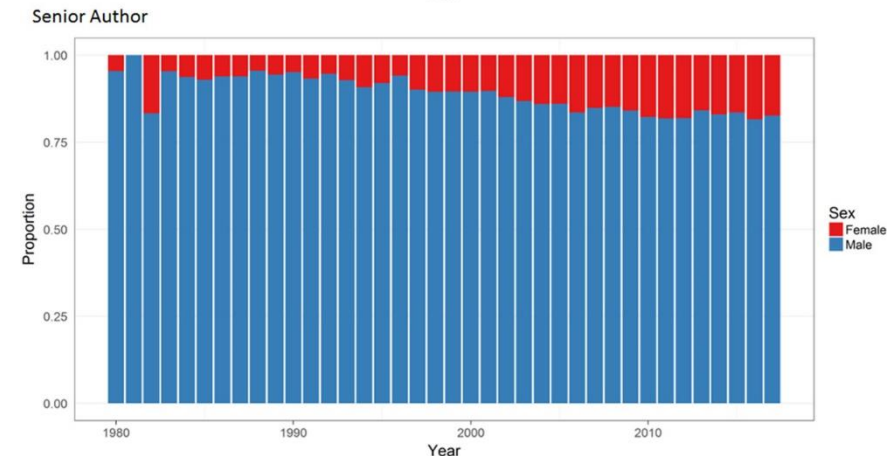
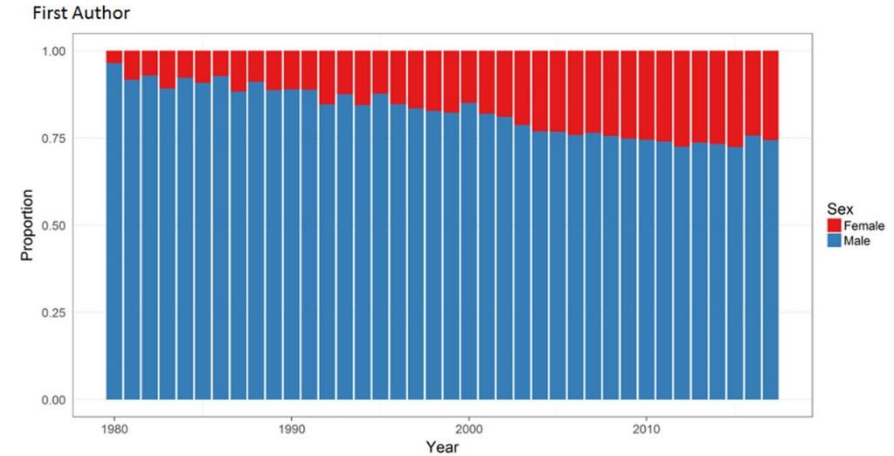
## Animal experimentation



## In vitro studies



## Sex of Authors in Cardiovascular Journals

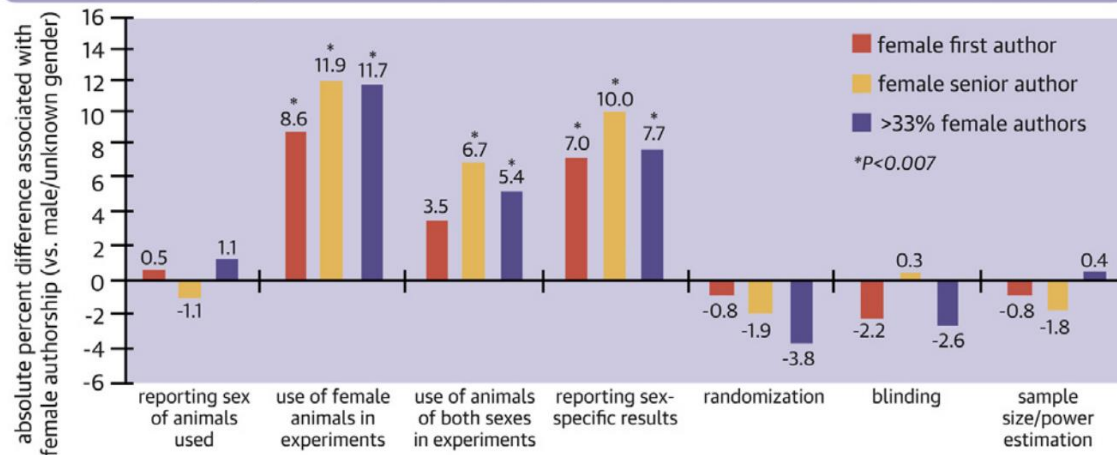


# Female Authorship in Preclinical Cardiovascular Research

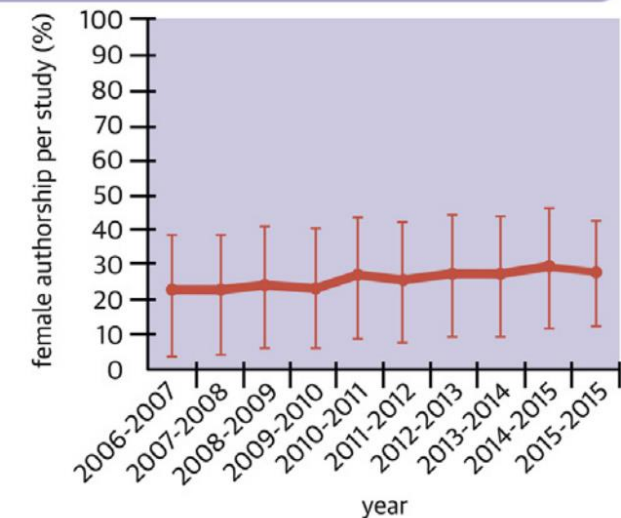
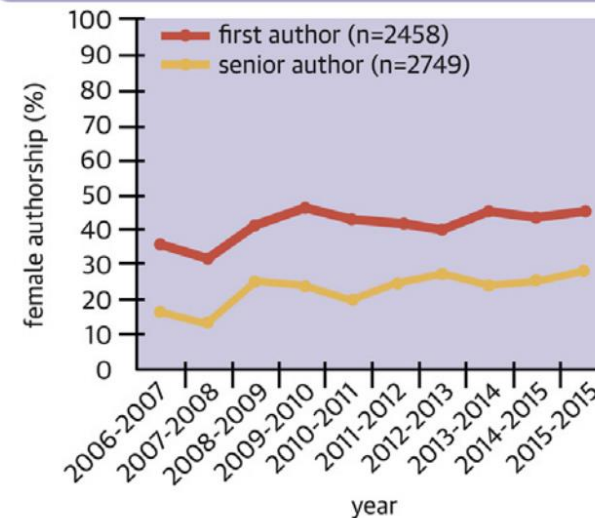
## Temporal Trends and Influence on Experimental Design

**“In preclinical studies that reported the sex of the animals used, *female authorship was positively associated with studying female animals, using animals of both sexes, and reporting sex-specific results, which are findings that persisted in adjusted and sensitivity analyses.*”**

Association of Female Authorship with Considering Sex as a Biological Variable and other Experimental Standards in Preclinical Cardiovascular Research

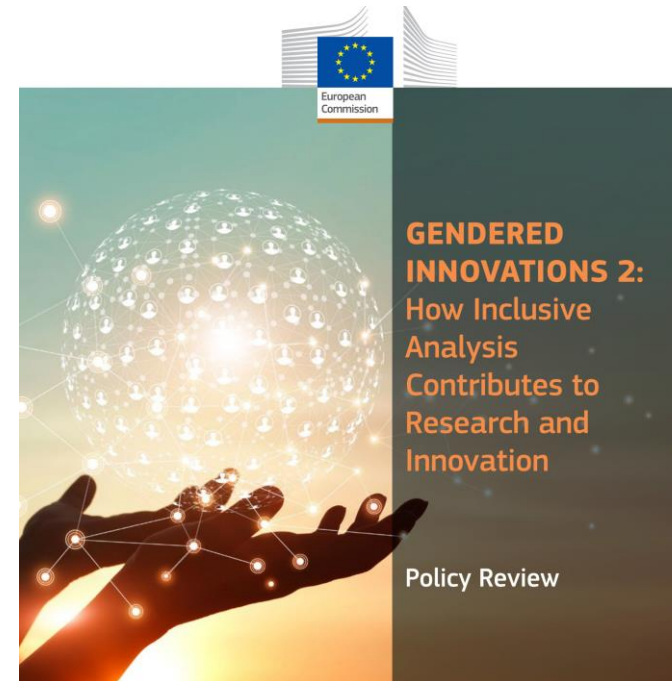


Female Authorship in Preclinical Cardiovascular Research





# Gendered Innovations



## Three Strategic Approaches

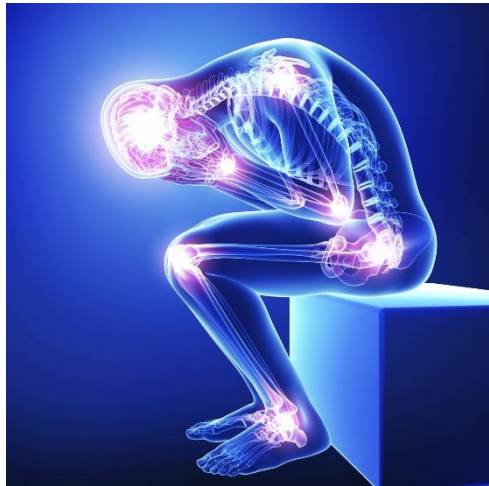
1. "**Fix the Numbers**" focuses on increasing women's and underrepresented groups' participation.
2. "**Fix the Institutions**" promotes inclusive equality in careers through structural change in research organizations
3. "**Fix the Knowledge**" or "gendered innovations" stimulates excellence in science and technology by integrating sex, gender, and intersectional analysis into research.



# Sex and gender analysis improves science and engineering



## Opportunities for discovery



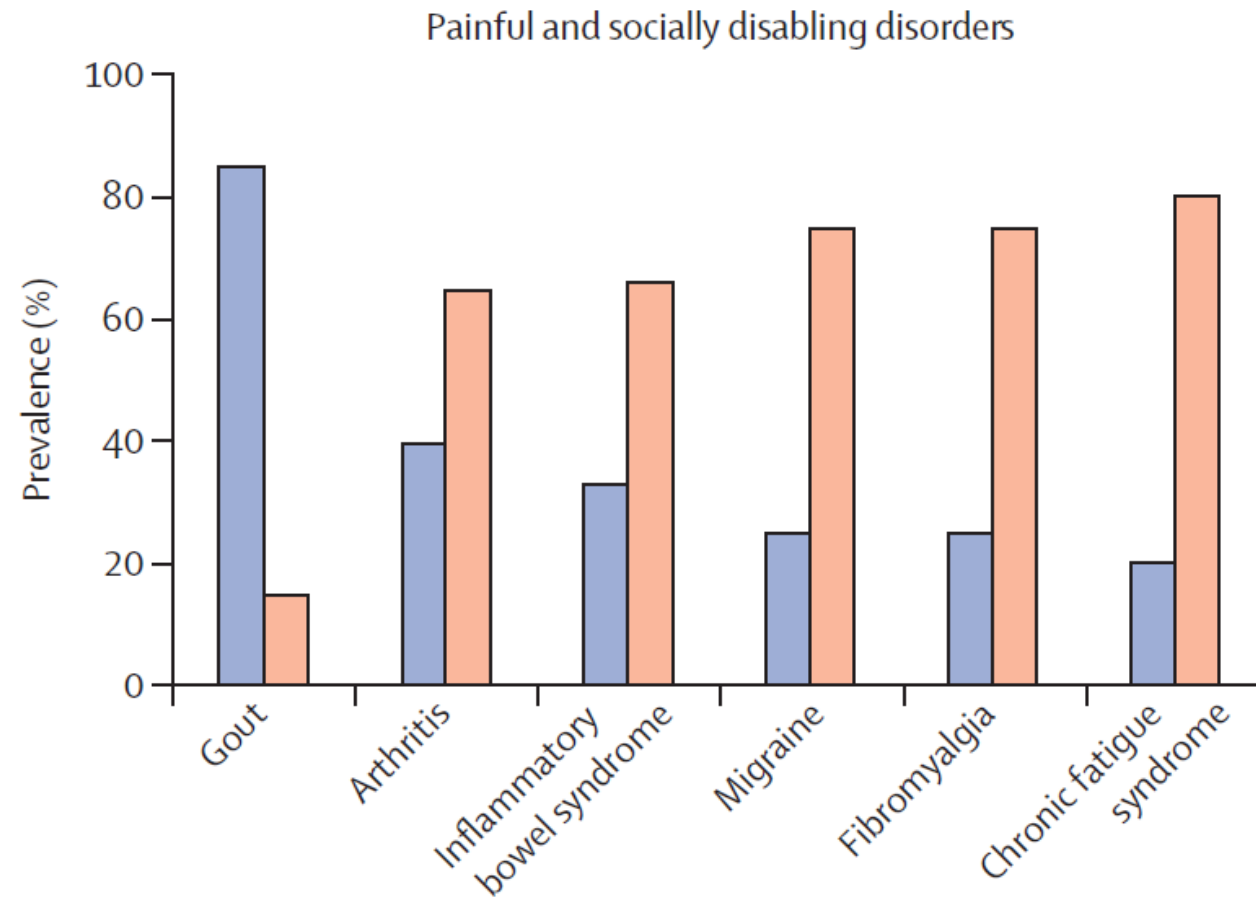
**Pain sensing:** Inhibitors of microglia reduce pain sensing in male—but not female—mice, underscoring the potential importance of sex-dependent molecular pain pathways

# Sex and Gender Differences in Pain Perception



**Women suffer more often from chronic pain.....**

Male individuals  
Female individuals



# Sex and gender analysis improves science and engineering



## Opportunities for discovery



**Depression – sex specific responses to treatments:** Sexually divergent networks in the brain with distinct patterns of stress-induced gene regulation in males and females

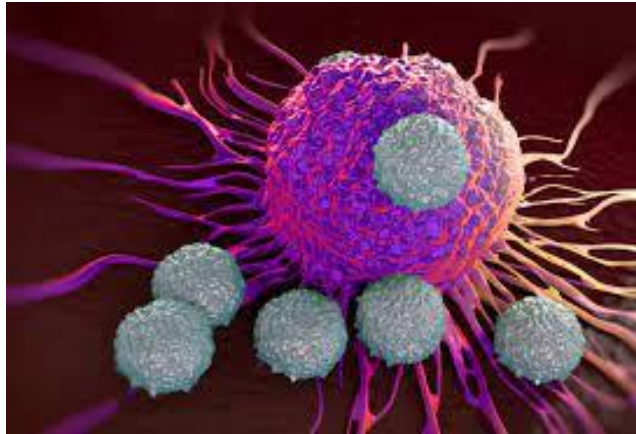


**Drug dosing:** The gene for the arginine vasopressin receptor is found on the X chromosome in a region that is likely to escape X-chromosome inactivation, women are more sensitive to the antidiuretic effects of vasopressin than men -> reduced sodium concentration in women, more side effects

# Sex and gender analysis improves science and engineering



## Opportunities for discovery



**Cancer Immunotherapy:** A higher proportion of male patients with melanoma or lung cancer, who are treated with checkpoint inhibitors, achieve successful remission (potential mechanisms: natural killer cells are sensitive to oestrogen and testosterone)

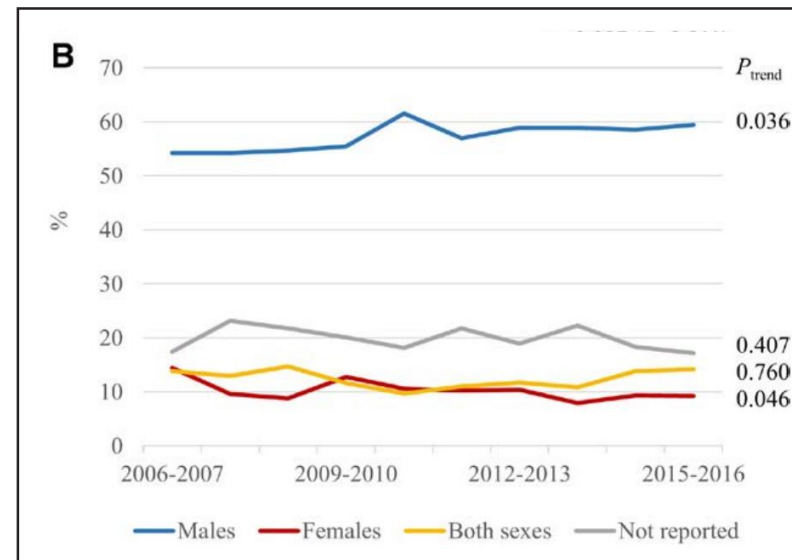
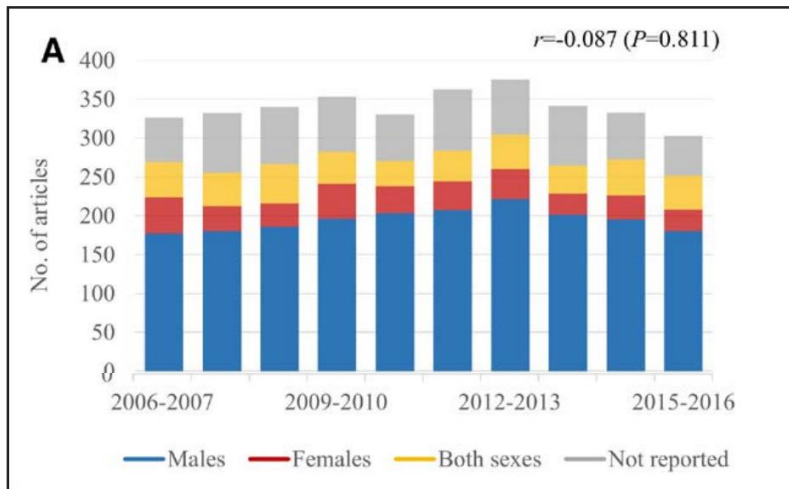


**X-Chromosome:** Sex chromosomes were excluded from most **GWAS** studies. Recent tools in computational biology and statistical genetics software will facilitate the exploration of X-chromosome-related expression in complex diseases (**XWAS**)

# Time Trend.....

## Sex Bias Is Increasingly Prevalent in Preclinical Cardiovascular Research: Implications for Translational Medicine and Health Equity for Women

A Systematic Assessment of Leading Cardiovascular Journals Over a 10-Year Period

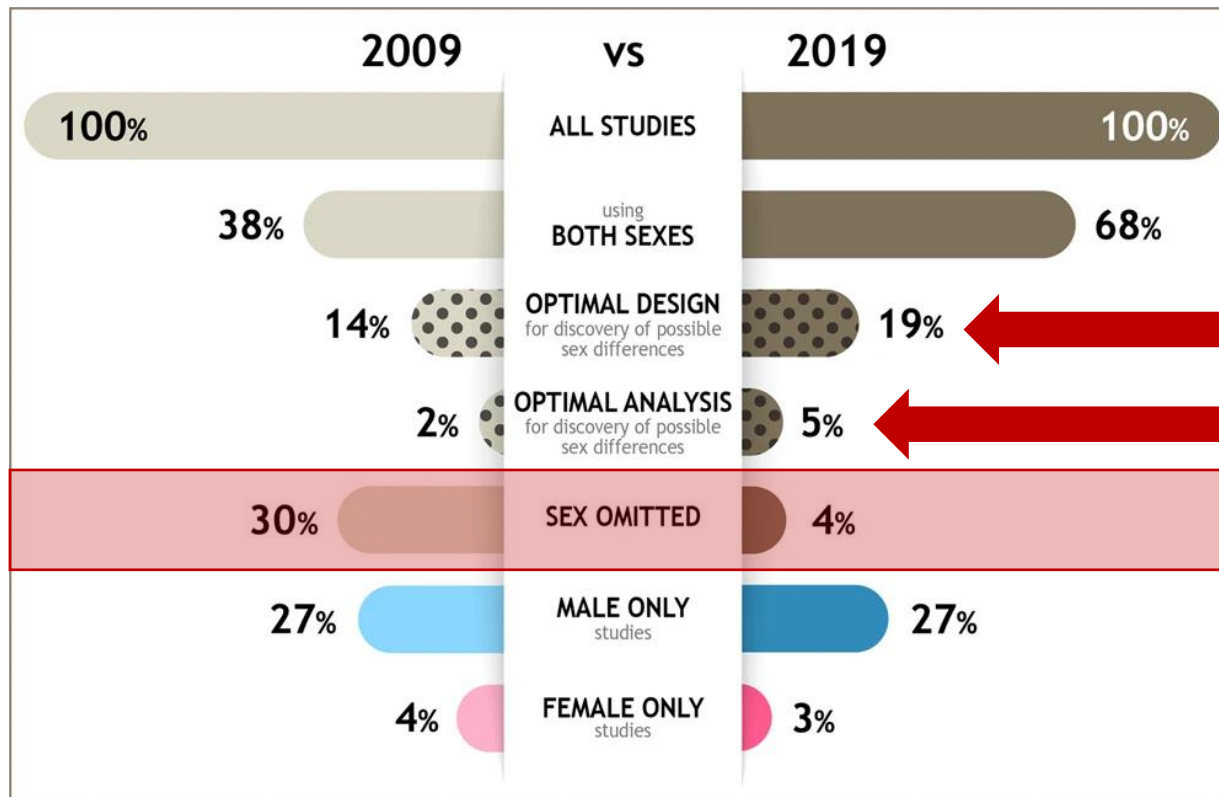


← P trend calculated for the proportion of studies using exclusively males

← P trend calculated for the proportion of studies using exclusively females

# Time Trend.....

## Analysis of neuroscience and psychiatry papers published in 2009 and 2019



*“Only 19% of papers in 2019 used an optimal design for discovery of possible sex differences, and only 5% of the papers analysed sex as a discovery variable.”*

# Gender Medicine: The Long and Rocky Road to Equality





# Recent Advances and Future Outlook



NEWS • Daily News

## First-Ever Cardiac Surgery Trial in Women Poised to Launch: ROMA-Women

Researchers hope this “offspring” trial design offers a chance to address the entrenched under-enrollment of women in CV trials.

by [Shelley Wood](#) APRIL 07, 2023

Hochschulen

## Geschlechtersensible Medizin: Acht medizinische Fakultäten kooperieren

Dienstag, 20. Dezember 2022

nature communications



Article

<https://doi.org/10.1038/s41467-022-35266-6>

## Sex differences in allometry for phenotypic traits in mice indicate that females are not scaled males

Received: 27 March 2022

NEWS • Features

## Go Red for Women: Nearly 20 Years of Much Progress, Some Setbacks

The AHA's initiative has raised awareness and funded research, but even its strongest supporters see room to grow.

by [Caitlin E. Cox](#) FEBRUARY 03, 2023



European Heart Journal (2023) 00, 1–3  
<https://doi.org/10.1093/eurheartj/ehad125>

EDITORIAL

## Why Y? The Y chromosome may serve a cardiovascular purpose after all

Aeron M. Small and Peter Libby \*

Division of Cardiovascular Medicine, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School Boston, 77 Avenue Louis Pasteur, Boston, MA 02115, USA

# Recent Advances in Switzerland



## National Research Programmes (NRPs)



NRP Gender Medicine?

Research where it is needed most



CAS in  
Sex- and Gender-  
Specific Medicine

2023/2024



## Eröffnung der schweizweit ersten Professur für Gendermedizin

Di 01. November 2022

Das Berufungsverfahren ist eröffnet: Die Medizinische Fakultät der Universität Zürich besetzt zum nächstmöglichen Zeitpunkt eine Professur für Gendermedizin – die erste dieser Art in der Schweiz.



# Thank you!

## Team

Dr. Ahmed Haider, PhD ETHZ  
Dr. Alexia Rossi, MD, PhD  
Dr. Nidaa Mikail, MD, PhD student  
Angela Portmann, MSc ETHZ, PhD student  
Dr. Atanas Todorov, MD, PhD  
Dr. Geoffrey Warnock, PhD  
Dr. Michael Fiechter, MD, PhD  
Dr. Alexander Meisel, MD  
Dr. Nicola Lott, PhD  
Dr. Hazem Ahmed, PhD

## Doctoral students/Master students

Dominik Sager, pract. med.  
Nadia Hamouda, pract. med.  
Claudia Süttsch, pract. med.  
Adriana Vinzens, cand. med.  
Isabelle Glarner, pract.med.  
Noemi Sablonier, pract.med.

## Office

Ms Vjollca Coli



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Catherine Gebhard



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Sex and  
Gender in  
Medicine