ELSEVIER

# How to integrate sex, gender, and intersectional analysis into research

Londa Schiebinger, Cara Tannenbaum, Jessica Miles and Holly J. Falk-Krzesinski

27 August 2020

# About the speakers

Londa Schiebinger, PhD

Cara Tannenbaum, MD, MSc

Jessica Miles, PhD

Holly J. Falk-Krzesinski, PhD

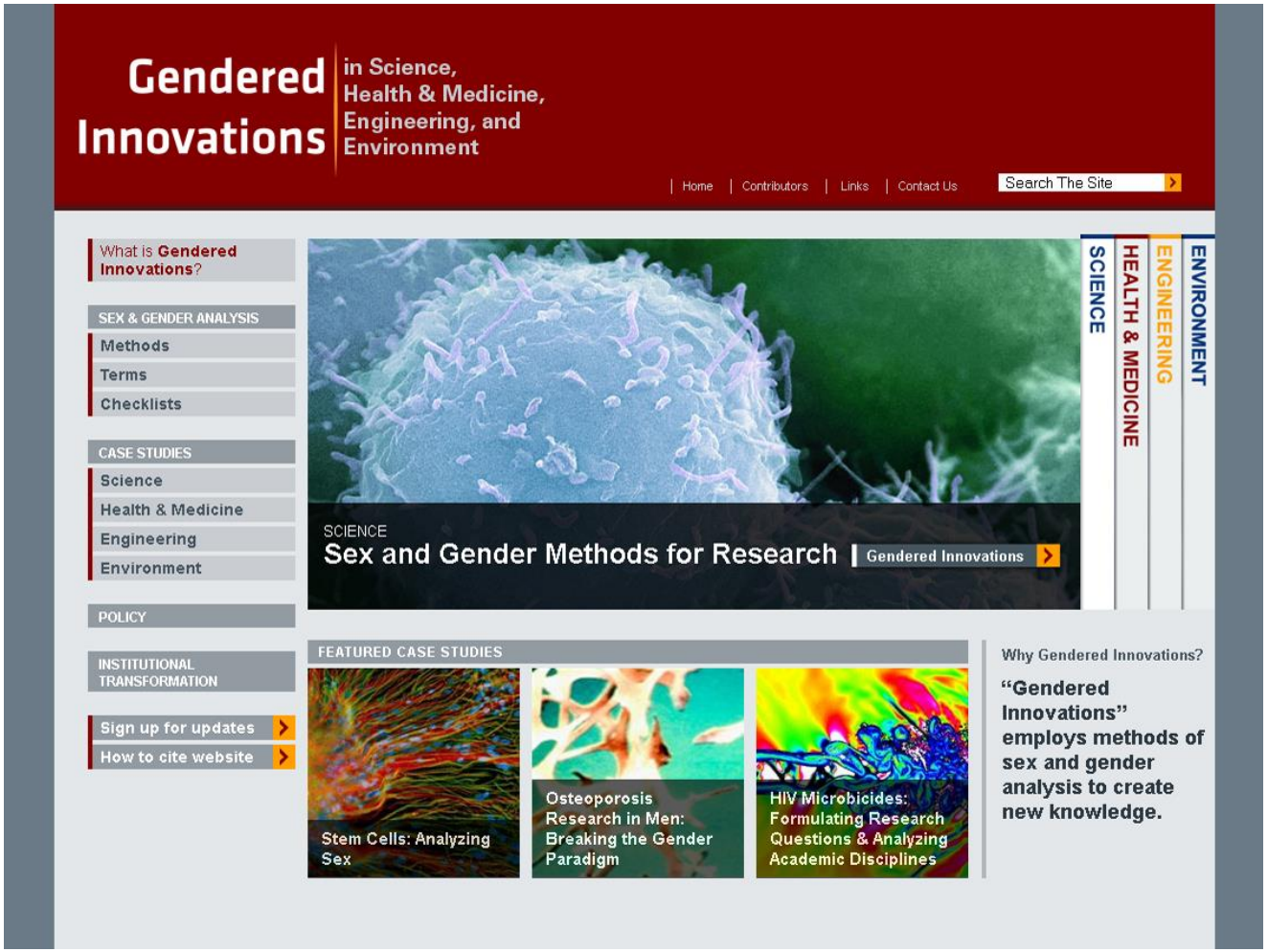
ELSEVIER

# How to integrate sex, gender, and intersectional analysis into research

Social Impact

Londa Schiebinger, Stanford University

27 August 2020




GENDEREDINNOVATIONS@STANFORD.EDU

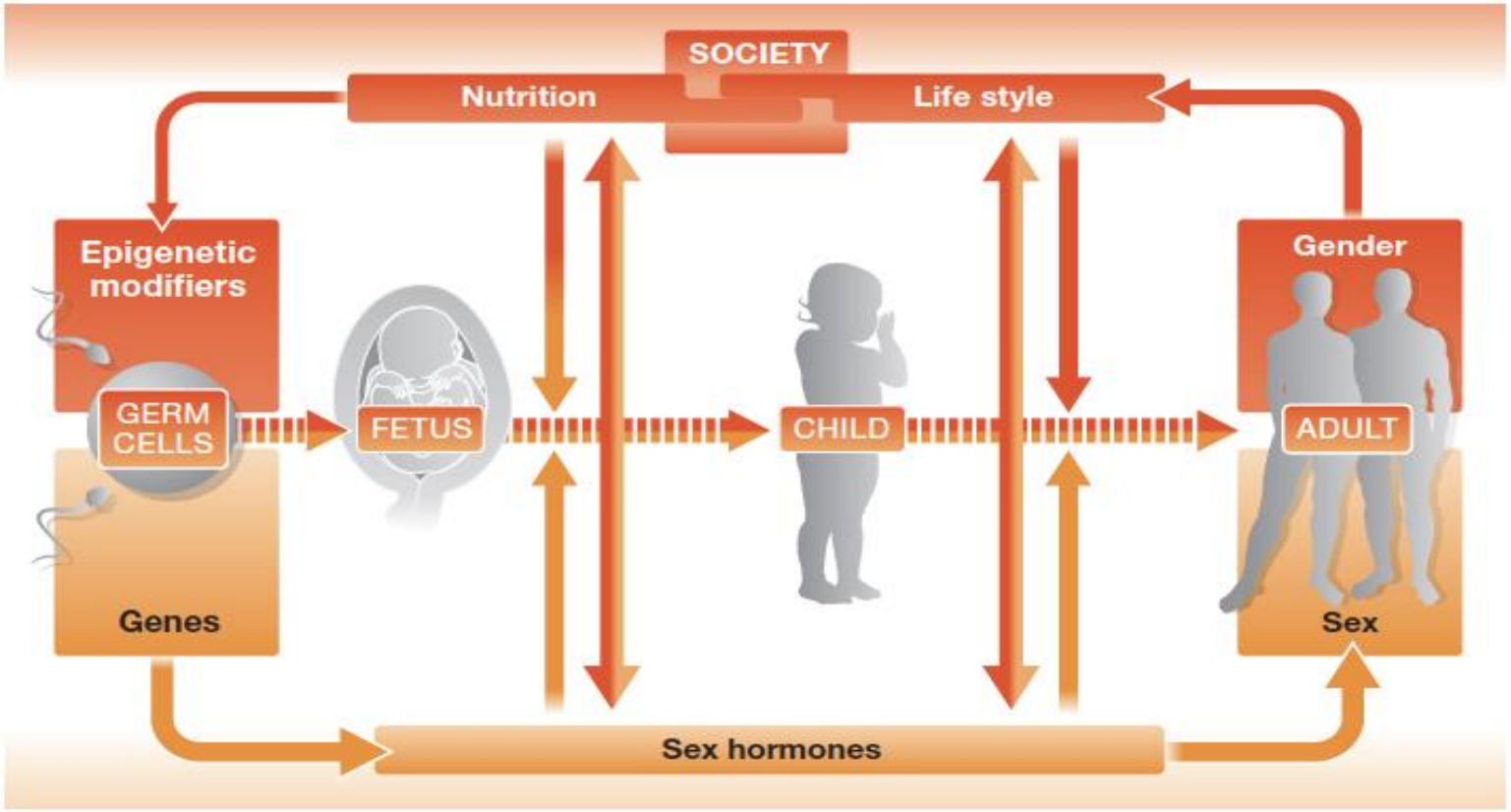
# Gendered Innovations…

- Can we harness the creative power of sex, gender, & intersectional analysis for discovery?


- *Gendered Innovations 2: How Inclusive Analysis Contributes to Research and Innovation* (Brussels: European Commission, forthcoming autumn 2020).

# Sex and Gender Interact

Regitz-Zagrosek, V. (2012). Sex and Gender Differences in Health. *EMBO Reports, 13 (7):* 596-603.



# Figures for US. The Williams Institute, 2016.

| | Percentage | Population |
|---|---|---|
| Female | 51% | 163 mill. |
| Male | 49% | 157 mill. |
| Intersex | 0.06-1.7% | 190,000-5.5 mill. |
| Transgender | 0.6% | ~1.9 mill. |
| Gender-fluid | unknown | unknown |

# Doing Research Wrong Costs Lives and Money

Programs and engineered systems fail—and fail more often for women and people of color.

# Google Search

- Men are 5 times more likely than women to be offered ads for high-paying executive jobs.

Datta, Amit, Michael Carl Tschantz, and Anupam Datta. "Automated experiments on ad privacy settings." *Proceedings on Privacy Enhancing Technologies* 2015.1 (2015): 92-112.

# Machine Learning

- Word embeddings capture associations between words that risk perpetuating harmful stereotypes, such as “man:computer programmer :: woman:homemaker.”

Bolukbasi, T. et al. (2016). Man is to computer programmer as woman is to homemaker? Debiasing word embeddings. *Advances in Neural Information Processing Systems*, 4349-4357.

# Health Technology

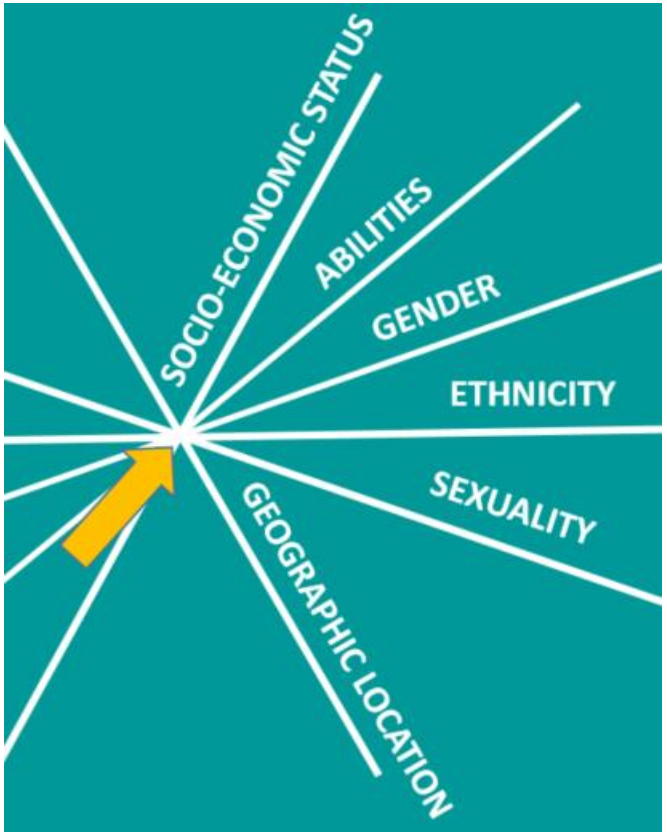
- Soap dispenser don't work for people with darker skin.
- More seriously, heart-rate monitors, even Apple watches, don't work for darker skinned people—which may put them at risk for serious conditions, such as heart disease.
- Pulse oximeters overestimate arterial oxyhemoglobin saturation in patients with darker skin.

Feiner, J. R. et al. (2007). Dark skin Decreases the Accuracy of Pulse Oximeters at Low Oxygen Saturation: The Effects of Oximeter Probe Type and Gender. *Anesthesia & Analgesia*, *105*(6), S18-S23

# Electrical Computer Engineering

- Nikon's camera software is designed not to take a photo if someone is blinking. It misreads images of Asian people as always blinking.

# Intersectionality



# Facial Recognition

- Cannot see Black women's faces!

- ***Gender analysis***: systems performed better on men's faces than on women's faces
- ***Race analysis***: systems performed better on lighter-skin than darker-skin.
- ***Intersectional analysis***: system performed worst for Black women. Error rates were 35% for darker-skinned women, 12% for darker-skinned men, 7% for lighter-skinned women and less than 1% for lighter-skinned men.

Buolamwini, J., & Gebru, T. (2018). Gender Shades: Intersectional accuracy disparities in commercial gender classification. In *Conference on fairness, accountability and transparency* , 77-91.

# Facial Recognition

- Systems cannot “recognize” transgender faces, especially during transition periods.

- Facial cosmetics reduce the accuracy faci

# “The Bride Problem” in Computer Vision

Zou, J. & Schiebinger, L. AI can be sexist and racist — it's time to make it fair. *Nature*. July 2018, 324-326.

# ImageNet

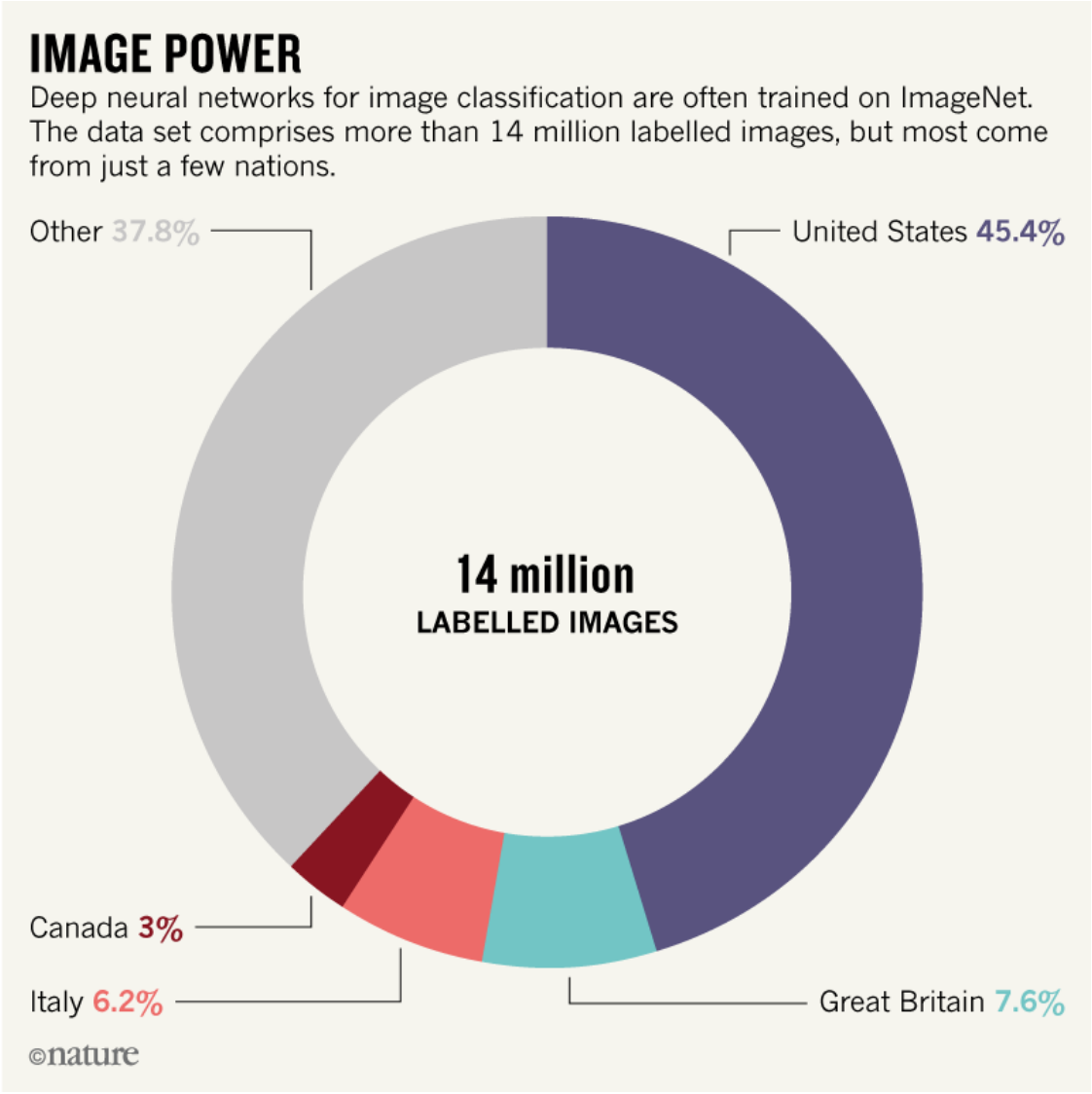


IMAGE POWER
Deep neural networks for image classification are often trained on ImageNet. The data set comprises more than 14 million labelled images, but most come from just a few nations.
Other 37.8%
United States 45.4%
14 million
LABELLED IMAGES
Canada 3%
Italy 6.2%
Great Britain 7.6%
©nature

# Solutions! Gendered Innovations

Zou, J. & Schiebinger, L. AI can be sexist and racist — it's time to make it fair. *Nature*. July 2018.

Tannenbaum, C., Ellis, R. P., Eyssel, F., Zou, J., & Schiebinger, L. (2019). Sex and gender analysis improves science and engineering. *Nature*, *575*(7781), 137-146.

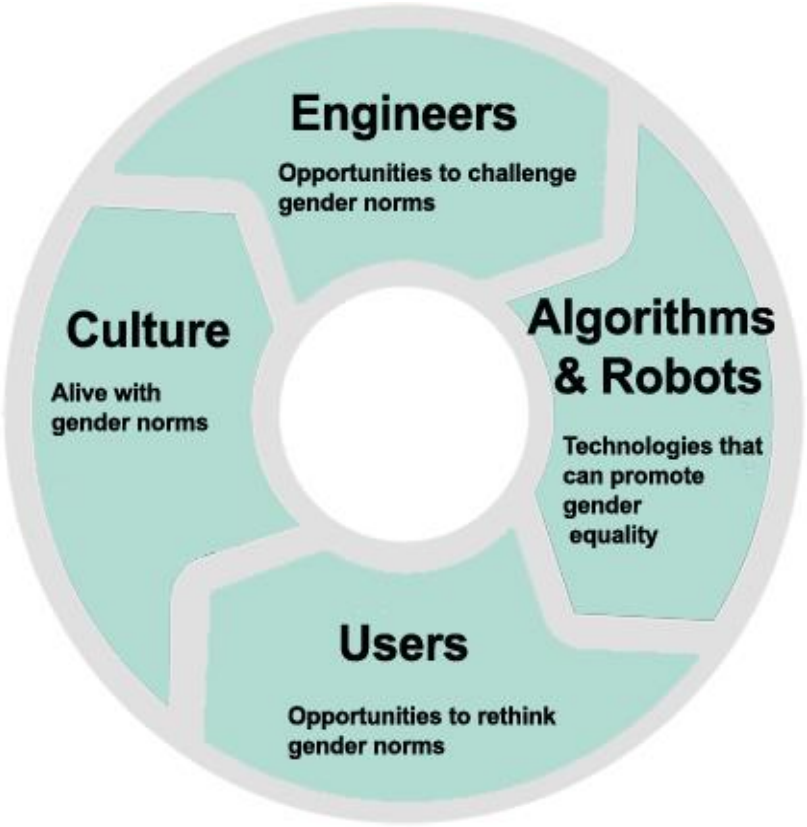
New Case Studies: Machine Learning: Analyzing Gender and Facial Recognition: Analyzing Gender and Intersectionality in Machine Learning, coming soon.

# Gendered Innovations Workshop on Gender and Robotics, 2018

- What genders robots?
- How do we design socially-responsible robots?

GI Case Study: Gendering Social Robots
http://genderedinnovations.stanford.edu/case-studies/genderingsocialrobots.html#tabs-1

# The challenge for roboticists is to create a **virtuous** cycle of design:



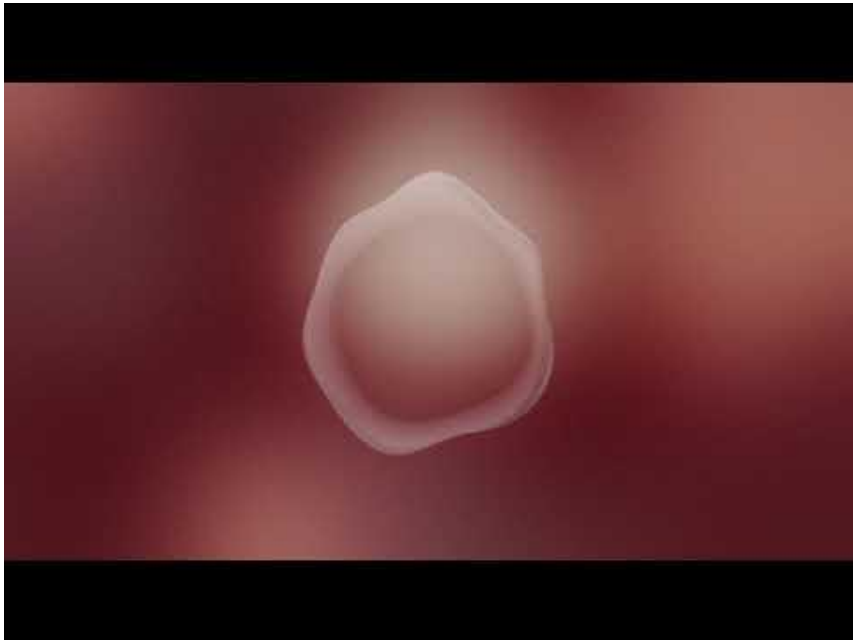
# What genders a robot?

**Pepper**


- Color
- Voice
- Name
- Anatomy
- Personality (or “character”)

http://genderedinnovations.stanford.edu/case-studies/genderingsocialrobots.html#tabs-2

# Gendered Innovations



“Q,” the genderless voice  developed in Denmark, 2019.

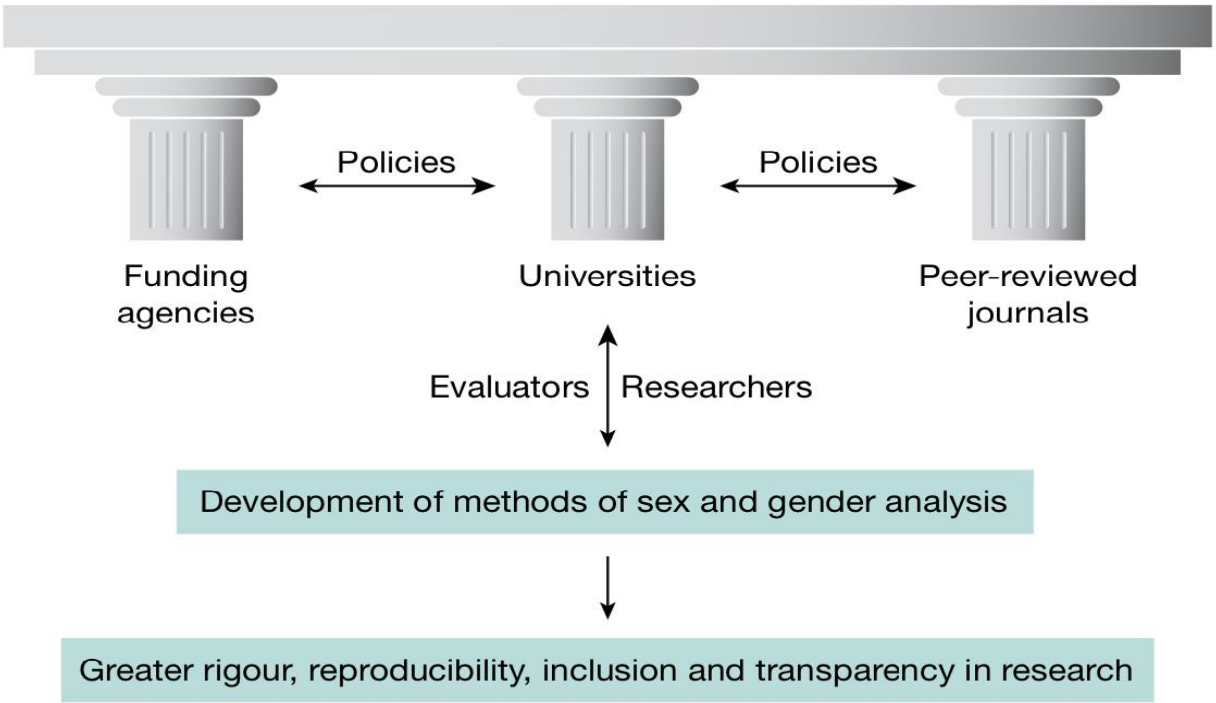
# Racial Innovation—that still requires a gender innovation!

Customizable skin tones

# Join the Gendered Innovations listserv (for updates from Londa Schiebinger on research in this field)

- Sign up on the Gendered Innovations website, at “Contact us”: https://mailman.stanford.edu/mailman/listinfo/genderedinnovations
- Follow us on Twitter: @GenderInnovate

# Three Pillars of Science Infrastructure




To reap the benefits of sex, gender, and intersection analysis, the pillars of science infrastructure must coordinate policies. For current policies, see Gendered Innovations, Policy Recommendations.

# About the speaker

**Londa Schiebinger** is the John L. Hinds Professor of History of Science at Stanford University, and Director of EU/US Gendered Innovations in Science, Health & Medicine, Engineering, and Environment. She is a leading international expert on gender in science and technology and has addressed the United Nations on that topic. Schiebinger received her Ph.D. from Harvard University, is an elected member of the American Academy of Arts and Sciences, and the recipient of numerous prizes and awards, including the prestigious Alexander von Humboldt Research Prize and Guggenheim Fellowship.

Her global project, Gendered Innovations, harnesses the creative power of sex, gender, and intersectional analysis to enhance excellence and reproducibility in science and technology. See AI can be Sexist and Racist—It's Time to Make it Fair *Nature*, 559.7714 (2018), 324-326; Sex and Gender Analysis Improves Science and Engineering *Nature*, *575*.7781 (2019), 137-146. For late-breaking news on Gendered Innovations, sign up here: https://mailman.stanford.edu/mailman/listinfo/genderedinnovations or follow us on Twitter @GenderStanford.

CIHR INSTITUTE OF GENDER AND HEALTH
SHAPING SCIENCE FOR A HEALTHIER WORLD

L'INSTITUT DE LA SANTÉ DES FEMMES ET DES HOMMES DES IRSC
FAÇONNER LA SCIENCE POUR UN MONDE EN MEILLEURE SANTÉ

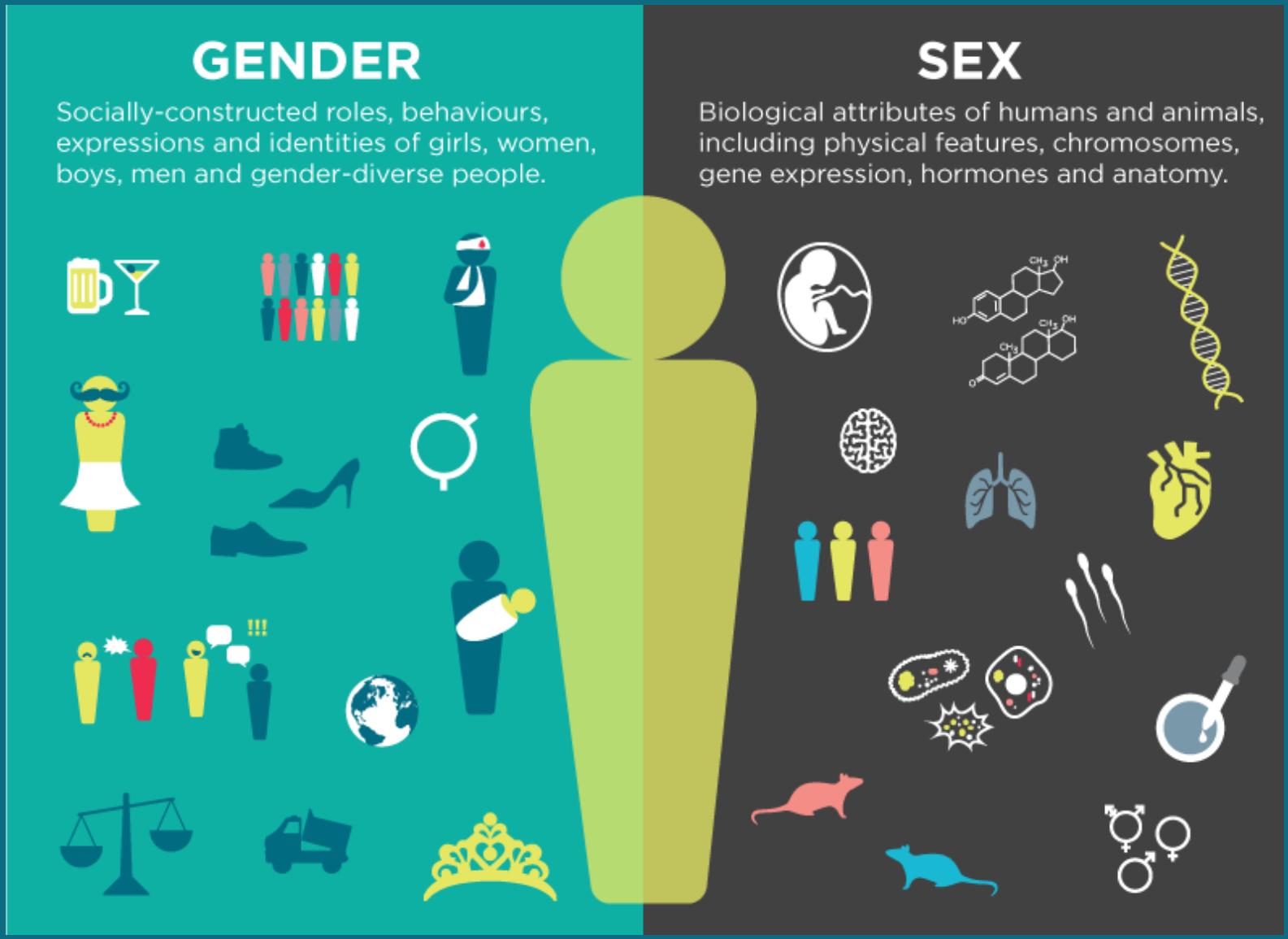
# INTERGRATING SEX, GENDER & INTERSECTIONALITY INTO HEALTH RESEARCH

Elsevier Webinar

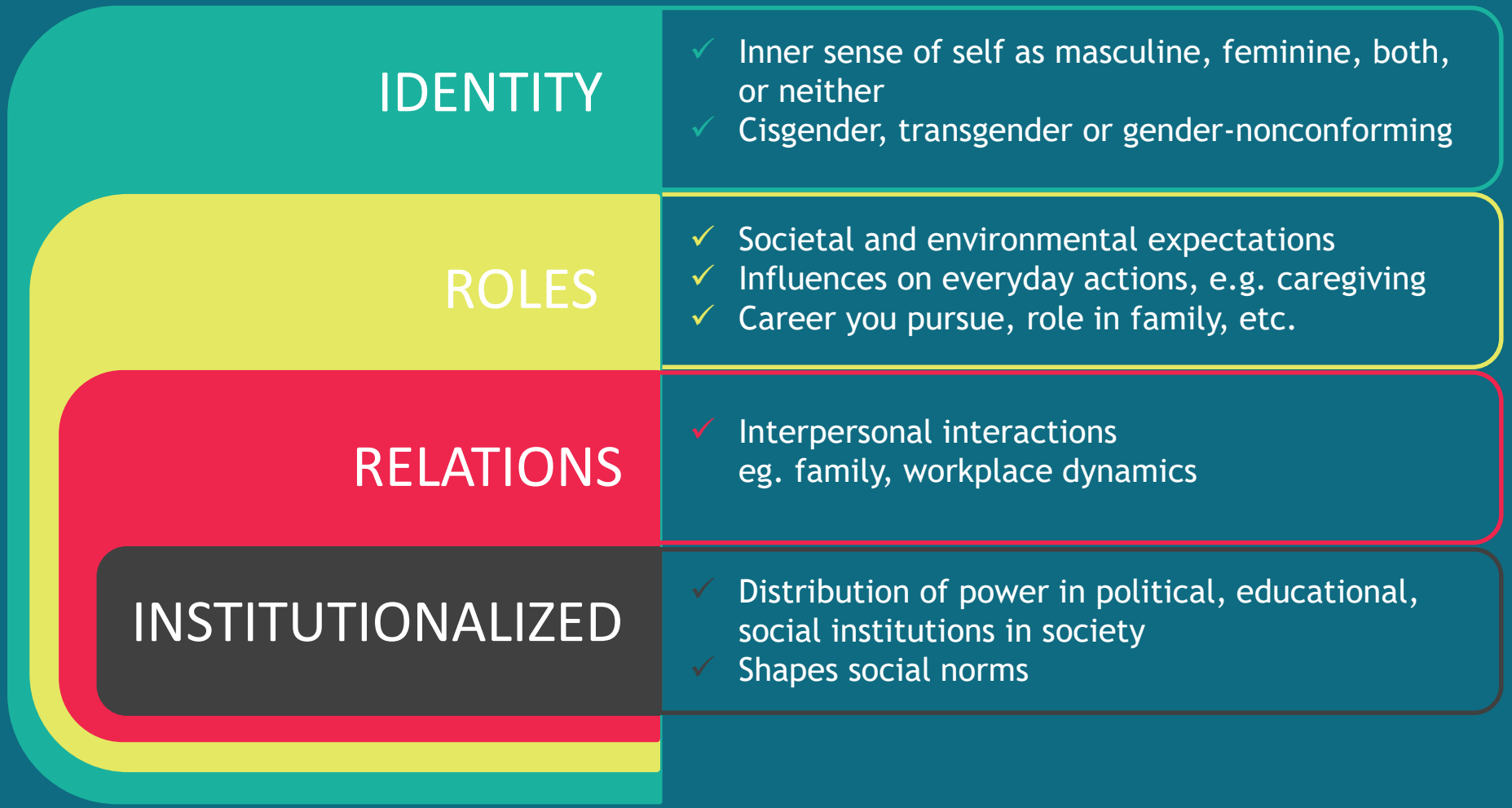
August 2020

Cara Tannenbaum, MD, MSc
Scientific Director
CIHR Institute of Gender and Health

# SEX VERSUS GENDER



# GENDER IS A MULTIDIMENSIONAL PSYCHOSOCIAL CONCEPT



# IT'S MORE THAN SEX AND GENDER: INTERSECTIONALITY

- The term 'intersectionality' was first coined by American critical legal race scholar Kimberle Williams Crenshaw.
  Crenshaw, 1989. *Univ Chicago Leg Forum*; 138:67

- Intersectionality involves the study of the ways that race, gender, disability, sexuality, class, age, and other social categories are mutually shaped and interrelated through forces such as colonialism, neoliberalism, geopolitics, and cultural configurations to produce shifting relations of power and oppression.

  Rice et al, 2019. *Cultural Studies - Critical Methodologies* 2019: 1–12


*Status of Women Canada, Gender-based Analysis Plus (GBA+), Government of Canada Approach 2017*

# SEX, GENDER & INTERSECTIONALITY ARE INSTRUMENTAL TO SCIENTIFIC EXCELLENCE & INTEGRITY

# THE BAD THINGS THAT CAN HAPPEN IF YOU IGNORE SEX, GENDER & INTERSECTIONALITY

1. People die!

Vanessa's Law

2. Sloppy science

nature reviews neuroscience

Perspective | Published: 02 June 2020

**Reproducibility of animal research in light of biological variation**

3. Policies & practices don't benefit everyone

# THE BENEFITS OF INTEGRATING SEX, GENDER & INTERSECTIONALITY

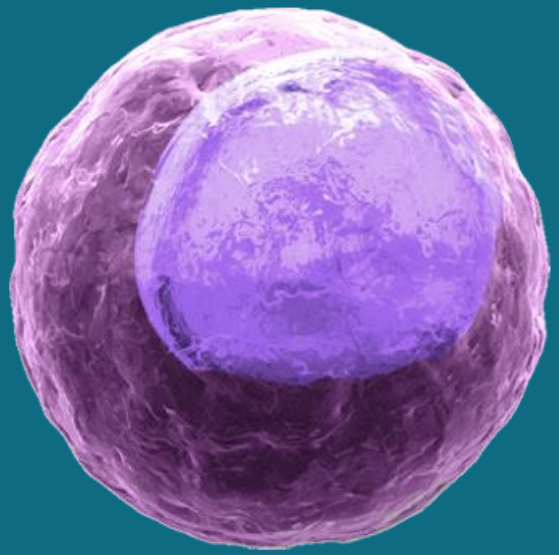
Scientific discovery

Improved research methodologies

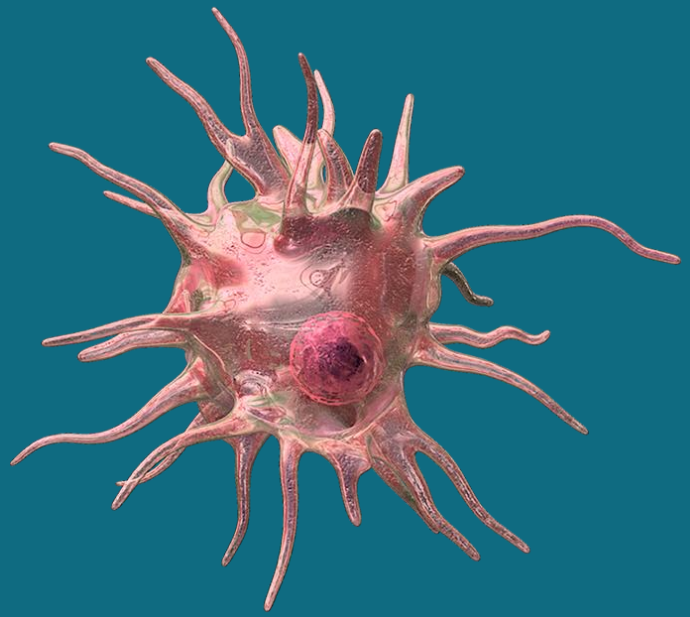
Enhance social equalities

# MALES & FEMALES EXHIBIT DIFFERENT IMMUNE CELL FUNCTION IN SPINAL CORD MEDIATION OF PAIN

Female Mice = T Cells

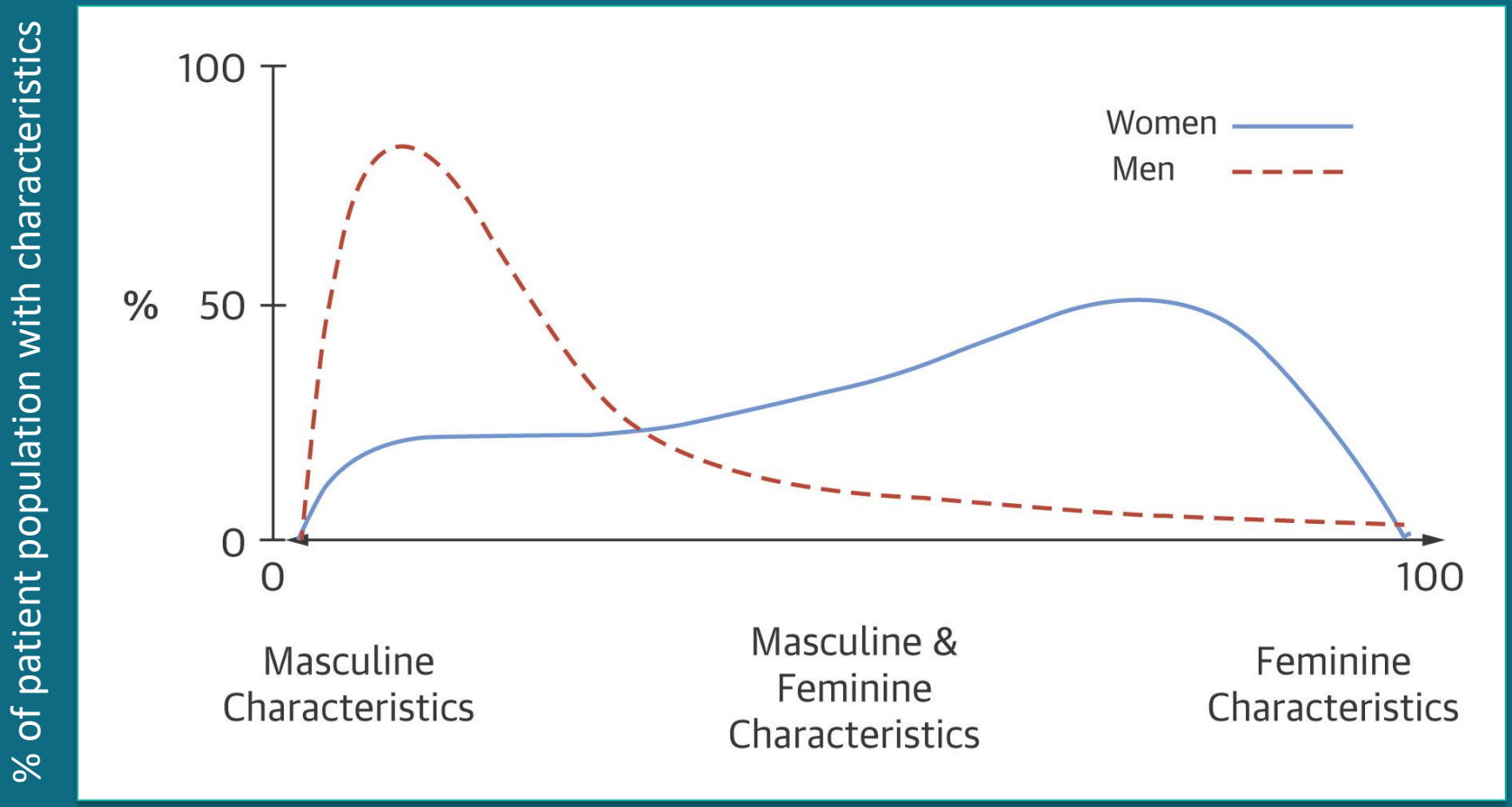


Male mice = Microglial Cells



Sorge et al. Different immune cells mediate mechanical pain hypersensitivity in male and female mice. Nature Neuroscience 2015; 31:1165-1167.

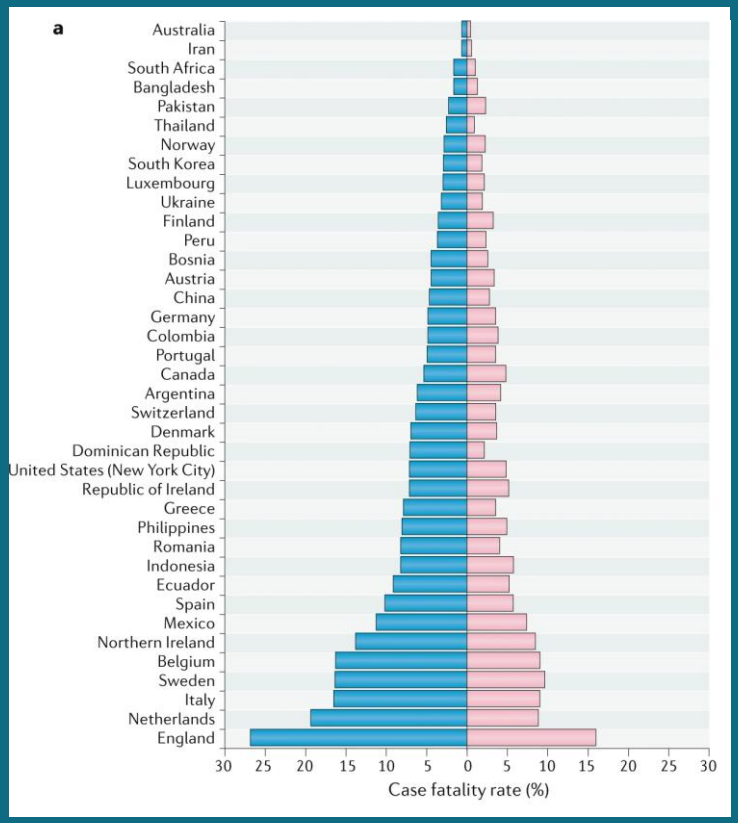
# GENDER ROLES, NOT BIOLOGICAL SEX, PREDICTS HEALTH OUTCOMES AFTER A HEART ATTACK




Pelletier R et al., 2016. *Journal of the American College of Cardiology.* 67: 127-135.

# COVID-19 REINFORCES THE IMPORTANCE OF SEX & GENDER ACROSS THE RESEARCH SPECTRUM

## COVID-19 Case Fatality Rates




nature reviews immunology June, 2020

**Considering how biological sex impacts immune responses and COVID-19 outcomes**

*Eileen P. Scully, Jenna Haverfield, Rebecca L. Ursin, Cara Tannenbaum and Sabra L. Klein*

**Biomedical**

SARS-CoV-2 receptor is X-linked
TMPRSS2 is regulated by androgens

**Clinical**

Males have more severe symptoms and more likely to die from COVID-19

**Health Services & Policy**

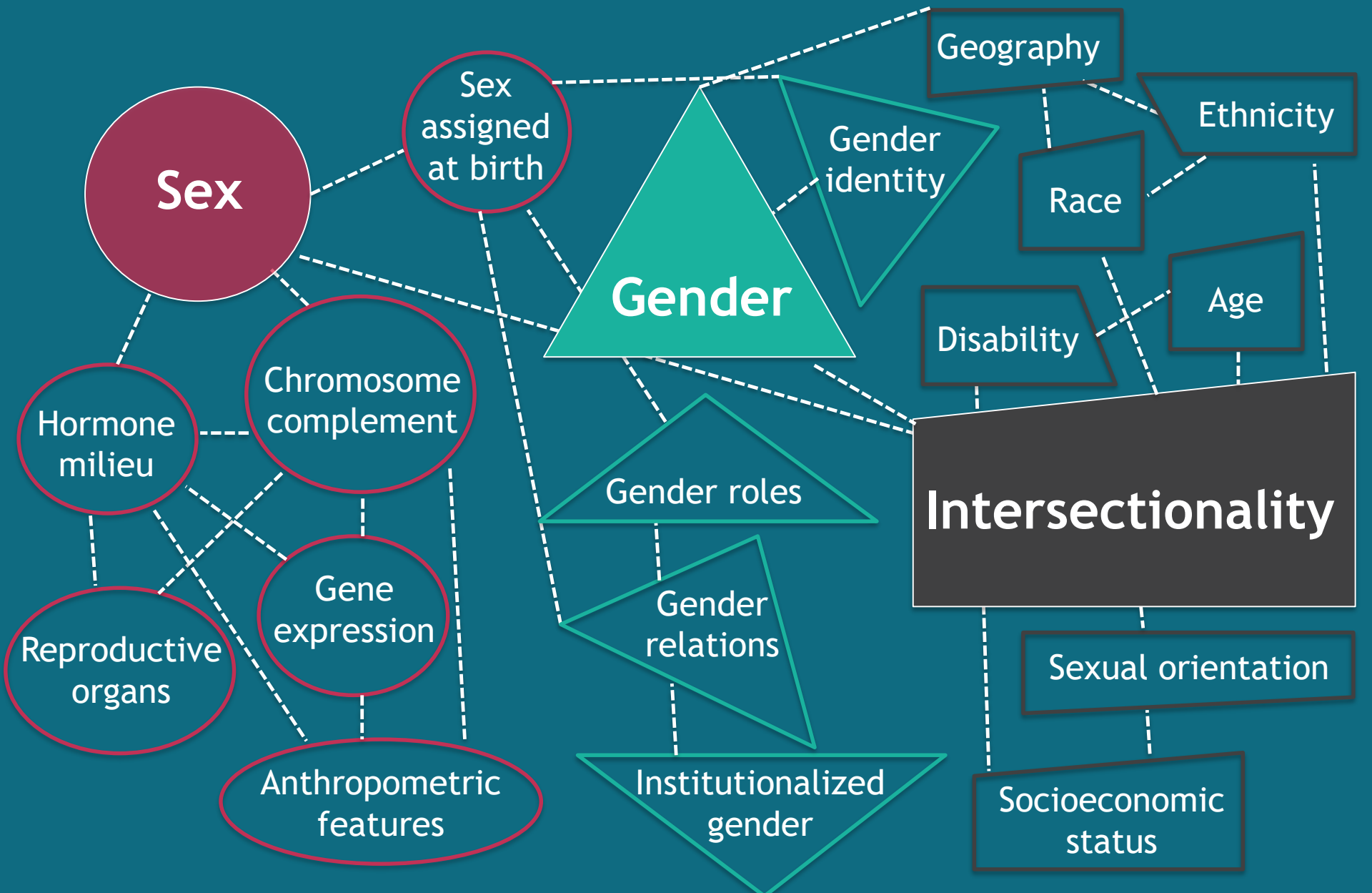
Women represent 70% of the global healthcare workforce and are more likely to be infected with SARS-CoV-2

**Population Health**

Gender is a risk factor for intimate partner violence, higher risk of mental stress due to COVID

# APPLYING A SEX, GENDER & INTERSECTIONAL LENS TO RESEARCH METHOD ASSESSMENT

# STEP 1: DETERMINE WHICH DIMENSION(S) OF SEX, GENDER & INTERSECTIONALITY ARE RELEVANT TO THE RESEARCH



# POSSIBLE GENDER-RELATED VARIABLES THAT MAY BE RELEVANT: HOW ARE THEY MEASURED?

## Roles

Housework responsibilities

Childcare responsibilities

Weekly work hours

## Relations

Physician-patient or experimenter-participant interaction

Civil status

Emotional support

## Institutionalized

Personal income

Education level

Status in community & country

# STEP 2: KNOW YOUR LITERATURE!

nature reviews genetics

Review Article | Published: 23 December 2018

## The role of sex in the genomics of human complex traits

Ekaterina A. Khramtsova, Lea K. Davis & Barbara E. Stranger

THE LANCET
Psychiatry

COMMENT | VOLUME 4, ISSUE 1, P8-9, JANUARY 01, 2017

## Sex and gender differences in mental disorders

Anita Riecher-Rössler

Published: November 14, 2016 • DOI: https://doi.org/10.1016/S2215-0366(16)30348-0

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Social Science & Medicine
Volume 74, Issue 11, June 2012, Pages 1712-1720

## Women's health, men's health, and gender and health: Implications of intersectionality

Olena Hankivsky

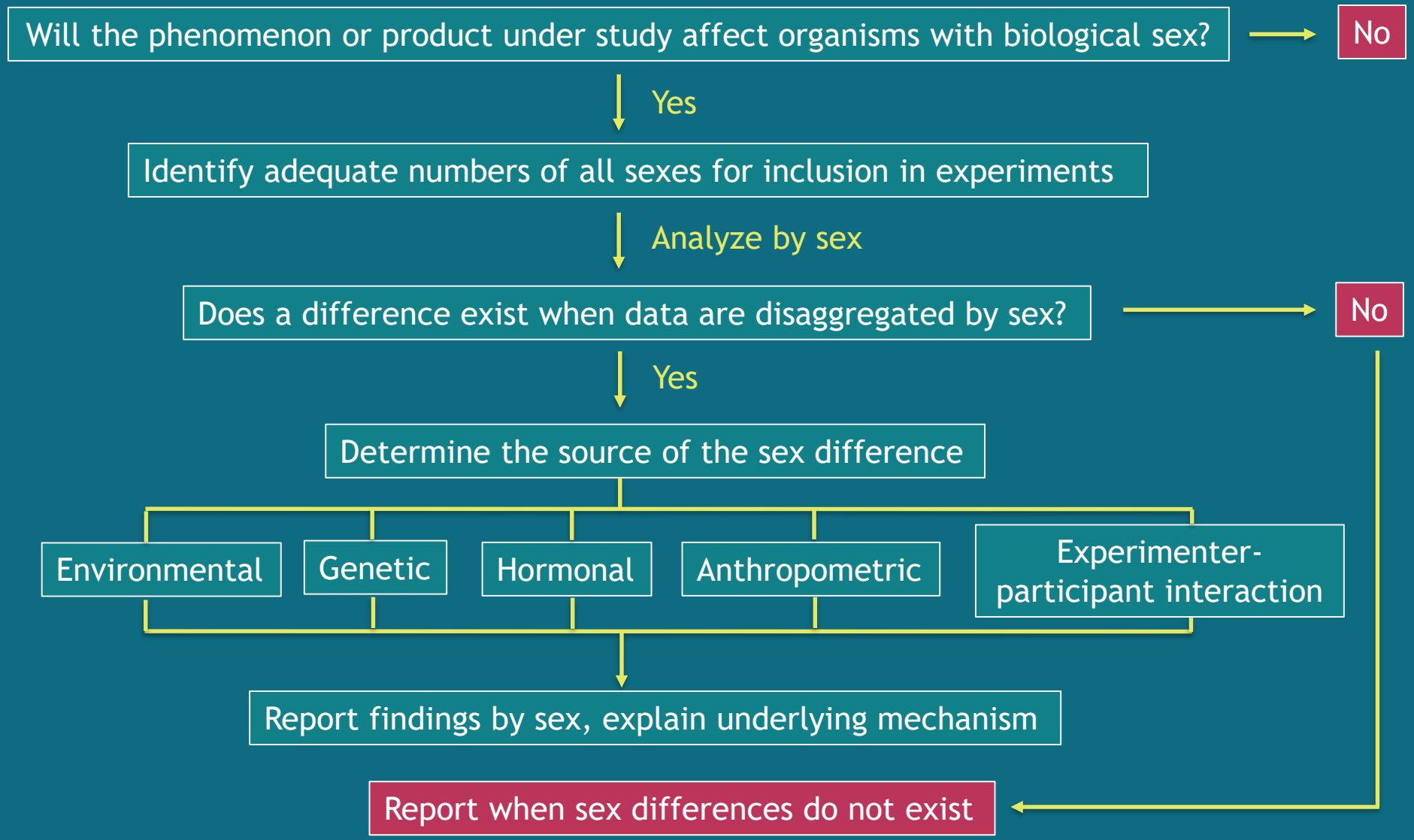
nature communications

Article | Open Access | Published: 14 June 2019

## XX sex chromosome complement promotes atherosclerosis in mice

Yasir AlSiraj, Xuqi Chen, Sean E. Thatcher, Ryan E. Temel, Lei Cai, Eric Blalock, Wendy Katz, Heba M. Ali, Michael Petriello, Pan Deng, Andrew J. Morris, Xuping Wang, Aldons J. Lusis, Arthur P. Arnold, Karen Reue, Katherine Thompson, Patrick Tso & Lisa A. Cassis

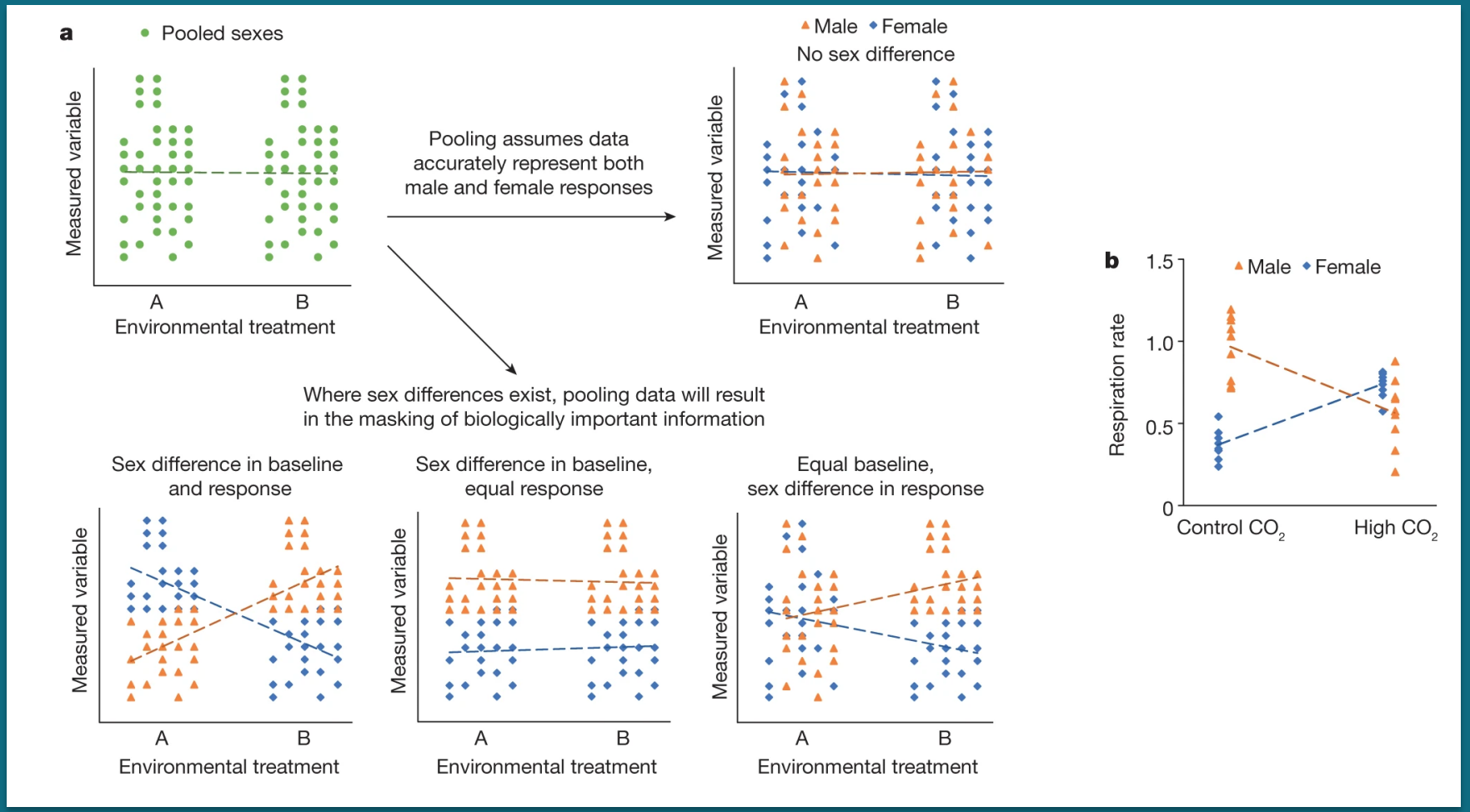
# STEP 3: SEX ANALYSIS AND REPORTING




Tannenbaum et al. 2019, *Nature:* **575**, 137–146

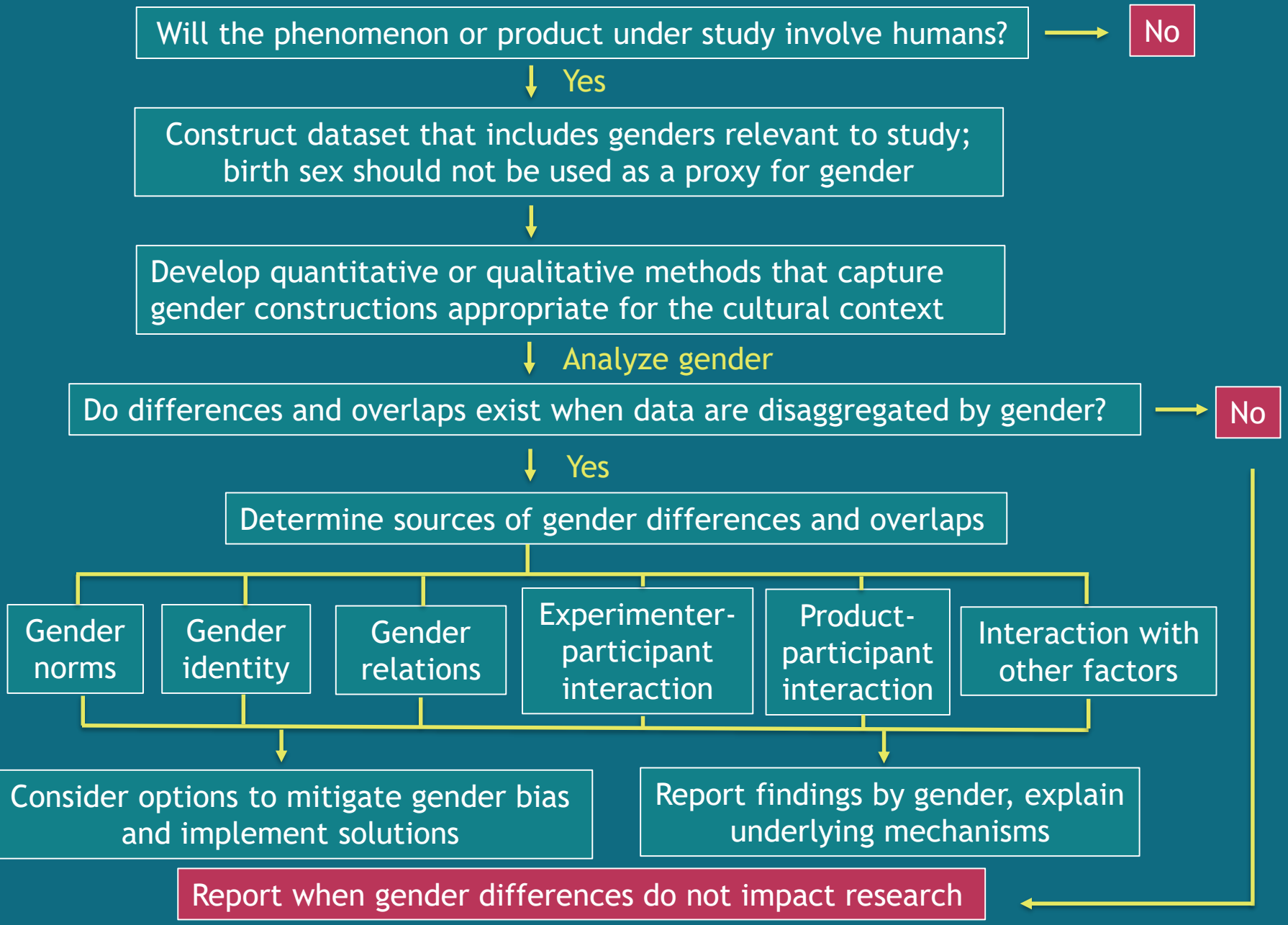
# KEY MESSAGE: DISAGGREGATE DATA BY SEX

If you don't, you might miss important differences.




Tannenbaum et al. 2019, *Nature:* **575**, 137–146

# STEP 4: GENDER ANALYSIS AND REPORTING



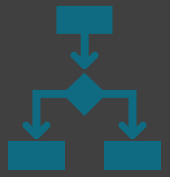
# STEP 5: INTERSECTIONAL ANALYSIS

Decide which groups with multiple power imbalances may need to be included

Include representative voices in the methods design team

Decide if a qualitative, quantitative or mixed methods approach is most appropriate to answer the research question

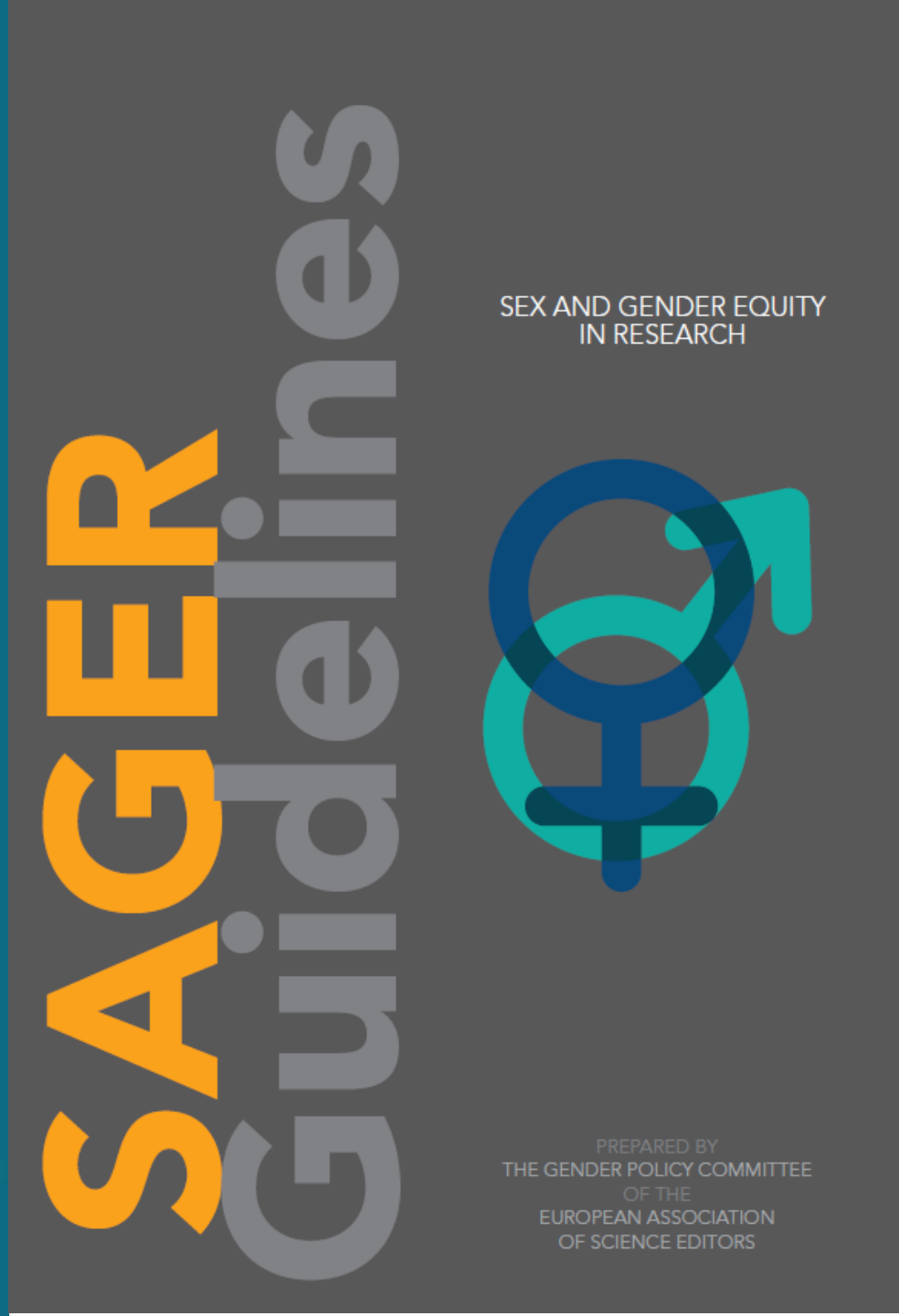
Engage communities and recruit/oversample individuals whose voices and experiences should be accounted for



Analyze separately with stratification, effect modification techniques, or by exploring the narratives

# PUBLISHING GUIDELINES MUST AND ARE CHANGING

http://www.ease.org.uk/about-us/gender-policy-committee



# ONLINE TRAINING MODULES

Sex and Gender in
Biomedical Research

Sex and Gender in Primary
Data Collection with Humans


Sex and Gender in the Analysis of
Data from Human Participants

www.discoversexandgender.ca

# SEX, GENDER AND COVID FACTSHEET

## Why Sex and Gender Need to be Considered in COVID-19 Research

*A Guide for Applicants and Peer Reviewers*

*First*, sex-disaggregated data reveal that more males are dying from COVID-19 than females. It is not clear if there are biological factors at play, or if comorbid and behavioural factors are to blame.

*Second*, pandemics can compound existing inequalities for girls, women, sexual and gender minorities and other at-risk populations. It is essential that these different subpopulations are considered in order to create effective, equitable policies and interventions.

**Applicants and Reviewers should appropriately account for the following in COVID-19 research proposals:**

**Molecular Mechanisms of Viral Pathogenesis**

☐ Include both male and female cells, as the SARS-CoV-2 receptor, ACE2, is X-linked and escapes X chromosome inactivation[1]. Disaggregate results by sex.

**Host Immune Response**

☐ Include male and female animals or humans, as sex hormones were shown to regulate the host immune response to SARS-CoV infection in mice[2]. Disaggregate results by sex.

**Diagnostic Tests and Serologic Antibody Testing**

☐ Sensitivity and specificity should be tested for males and females separately, as sex differences in viral titers and IgM/IgG antibodies have been reported for viral infections in humans and mice[3,4].

https://cihr-irsc.gc.ca/e/51939.html

# "MEET THE METHODS" SERIES

https://cihr-irsc.gc.ca/e/52107.html

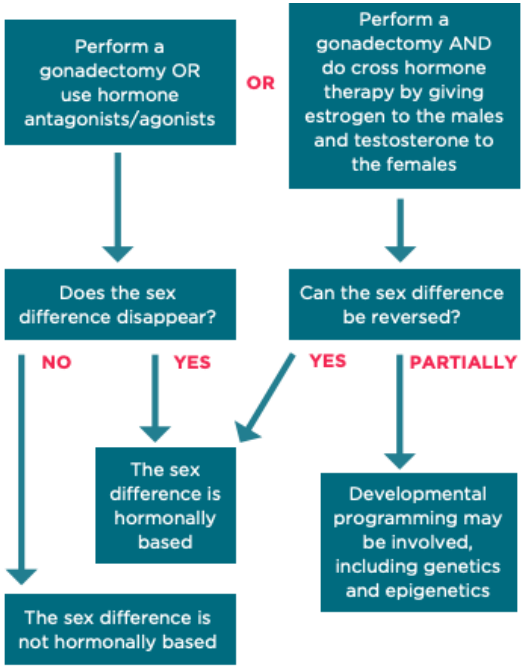
Issue 1 | August 2020

## MEET THE METHODS SERIES: MEASURING AND MANIPULATING SEX HORMONES IN LABORATORY ANIMALS

In basic science, sex hormones can be measured and manipulated in mice and rats using a variety of techniques. We asked Dr. Margaret McCarthy, Professor of Pharmacology at the University of Maryland, about her views on how to best integrate these methods in her research.

Dr. McCarthy's research focuses on the influence of sex hormones on the developing brain, with a special emphasis on understanding the cellular mechanisms that establish sex differences. Here are Dr. McCarthy's recommendations:

| Method | Advantages | Limitations |
|---|---|---|
| ELISA | • Highly sensitive and specific<br>• Widely available<br>• No specialized training required<br>• Inexpensive equipment | • Because it is antibody based, cross-reactivity is common and requires strict standardization<br>• Only measures circulating hormone levels, not reliable in some tissues where steroids are concentrated, such as the brain |
| RIA | • More sensitive and specific than ELISA<br>• Can measure hormones in blood and tissues | • Potential radiation hazards due to use of radioisotopes<br>• Requires specialized licensing and training<br>• Can have some cross reactivity due to being antibody-based |
| GC-MS | • The most precise with no cross reactivity<br>• Although less sensitive than ELISA and RIA, sensitivity is improving<br>• Can measure hormones in blood and tissues | • Requires the use of a core facility with specialized training<br>• Often more expensive than other approaches |



I INVITE YOU TO BE BOLD
AND PUSH BOUNDARIES

TO BE THE LEADERS
OTHERS FOLLOW

ONE DAY THE WORLD
WILL THANK YOU!

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# Thank you!

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# Journal editorial policies on sex & gender reporting in research at Elsevier

**Jessica Miles**, PhD
Publisher, Cell Press
Chair, Journal Editorial Policies on Sex & Gender Reporting in Research Workstream, Gender Working Group

**Holly J. Falk-Krzesinski**, PhD
VP, Research Intelligence, Global Strategic Networks
Co-Chair, Gender Working Group

August 27, 2020

**Elsevier's Gender Working Group**

# Elsevier has a responsibility to apply a gender lens in research.

1. The goal of the **Gender Working Group** is to examine key processes and principles and provide **targeted interventions** to ensure that Elsevier supports the most **robust research** possible in the most **equitable** and **inclusive** way.

2. The Gender Working Group is an internal forum that complements the work of the **external Inclusion & Diversity Advisory Board**, which brings together nine influential academic scientists, policymakers, I&D and gender researchers, and professionals in STEM who are committed to **driving change in gender balance**.

3. The Gender Working Group's current **key initiatives** focus on gender diversity at conferences, diversity on journal editorial boards, gender diversity in peer review, and journal **editorial policies on sex & gender reporting in research**.

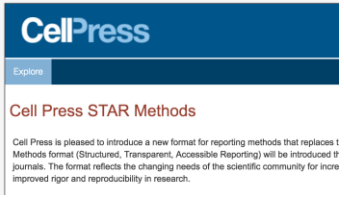
## Reporting sex and gender in experimental design and analysis

- We encourage researchers to **enroll women and ethnic groups** into clinical trials of all phases, and to plan to **analyse data by sex and by race.**
- For all study types, we encourage **correct use of the terms sex** (when reporting **biological factors**) and **gender** (when reporting **identity, psychosocial, or cultural factors**).
- Where possible, **report the sex and/or gender of study participants**, and describe the **methods used to determine sex and gender**.
- Separate reporting of data by demographic variables, such as age and sex, facilitates pooling of data for subgroups across studies and should be routine, unless inappropriate.
- **Discuss the influence or association of** variables, such as **sex and/or gender, on your findings**, where appropriate, and the limitations of the data.

ICMJE
INTERNATIONAL COMMITTEE of MEDICAL JOURNAL EDITORS
ICMJE Recommendations

**575+ biomedical journals feature guidance, adhere to ICMJE guidelines**


**Lancet family journals publish best practices, offer enhanced guidance**




**Cell Press uses STAR Methods for transparent reporting of methods and statistics**

See Schiebinger *et al*. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)32392-3/fulltext

**Author guidelines for use of inclusive language**

## Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities

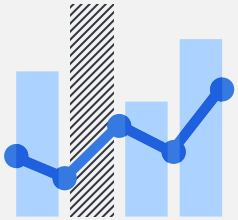
- Articles should make no assumptions about the beliefs or commitments of any reader, nor imply that one individual is superior to another on the grounds of race, sex, culture or any other characteristic
- Authors should ensure that writing is free from bias

**Now in place** in the Guide for Authors **for ~2000 journals**

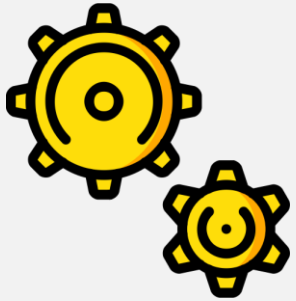
## What comes next?

**Expand our role as partner to many funding bodies and institutions**

**Optimize and extend guidelines to computer science, engineering, and other non-biomedical disciplines**



**Develop a process for compliance checking and decision support**



## Collaborating to drive adoption and adherence to sex and gender reporting guidance

Author

**Submission**

Editor

**Initial editorial evaluation**

Reviewer

**Peer Review**

Editorial Manager®

**Cloud-based manuscript submission and peer review system**

Integration of Editorial Manager® (EM) with SciScore applies technology to the end-to-end peer review process to drive adherence to journal sex and gender guidelines

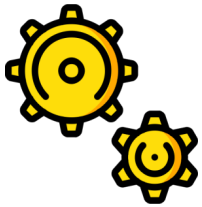
SciScore

- Scans method section to detect if authors address sex and other rigor and transparency metrics
- Assigns score, produces rigor adherence table
- Provides decision support for Editors

- SciScore's evaluation available within Editorial Manager to Reviewers
- Reviews can easily evaluate research for rigor and transparency adherence
- Provides decision support for Reviewers

**For more information on SciScore see: https://doi.org/10.1101/2020.01.15.908111**

Changing norms around study design and reporting to ensure that sex and gender are considered appropriately within research requires collective action



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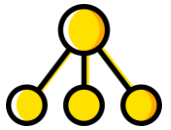

Authors
Reviewers
Editors

**We're committed to collaborating with you to drive meaningful change**

# Thank you!

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# Thank you.

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