

# The sex and gender dimension in frontier research

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# Sex and gender in research

- **What is the gender dimension**
- **Sex and gender analysis in research and innovation**
- **Gender balance in research teams**  
**Gender balance in decision making**
- **Of content and context**
- **The way forward**

# Why does it matter?

Dimensions	Values/Goals
Ideology	<ul style="list-style-type: none"><li>• (Health) Equity</li><li>• Remove health inequalities</li><li>• Social justice</li><li>• Fight discrimination</li><li>• Support fundamental rights</li></ul>
Outcomes	<ul style="list-style-type: none"><li>• Health promotion for women and men</li><li>• Better quality of life</li></ul>
Practice	<ul style="list-style-type: none"><li>• Transdisciplinary teams working on intersectional issues</li></ul>
Empowerment	<ul style="list-style-type: none"><li>• Support informed choice</li><li>• Offer tools for behavioural change</li><li>• Acceptance of people's lifestyle choices</li></ul>
Economy	<ul style="list-style-type: none"><li>• Achieve effectiveness</li><li>• Reduce costs through improvement of measures</li></ul>
Policy	<ul style="list-style-type: none"><li>• Set reasonable goals for health based on differentiated analysis</li><li>• Maintenance of current state can be a target</li></ul>

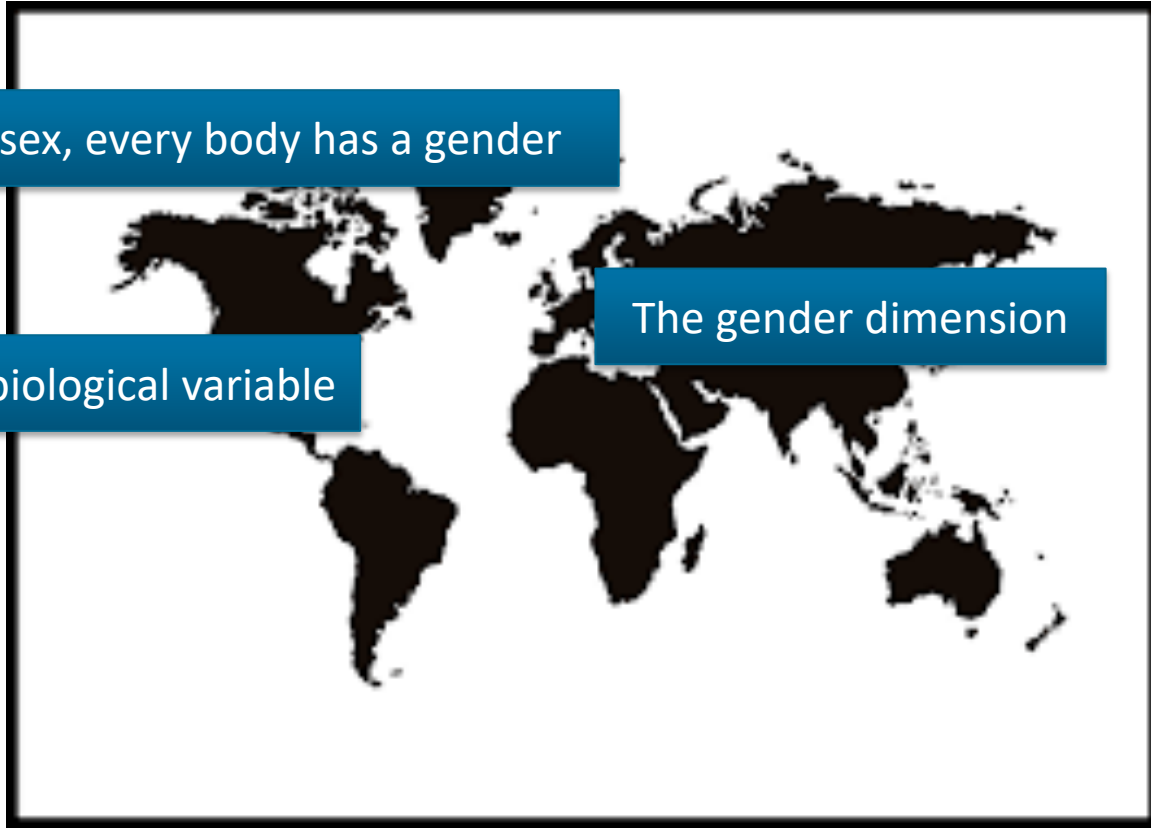
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# Definitions and priorities

Every cell has a sex, every body has a gender

SABV – sex as a biological variable

The gender dimension





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# Why do we need the gender dimension?

H 2020: “...**improve the scientific quality and societal relevance** of the produced knowledge, technology and/or innovation”

IGH : „...**improving the rigor, reproducibility and generalizability** of science. It’s about excellence...”

NIH : “....**enhance reproducibility through rigor and transparency** and increase the knowledge base....”

- **Reproducibility**
- **Excellence**
- **Societal value**

# HORIZON 2020



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## II. OBJECTIVES

Three objectives underpin the Commission's activities on gender equality in Horizon 2020. They are in line with the RTD strategy on gender as well as with the ones set in the ERA Communication of July 2012:

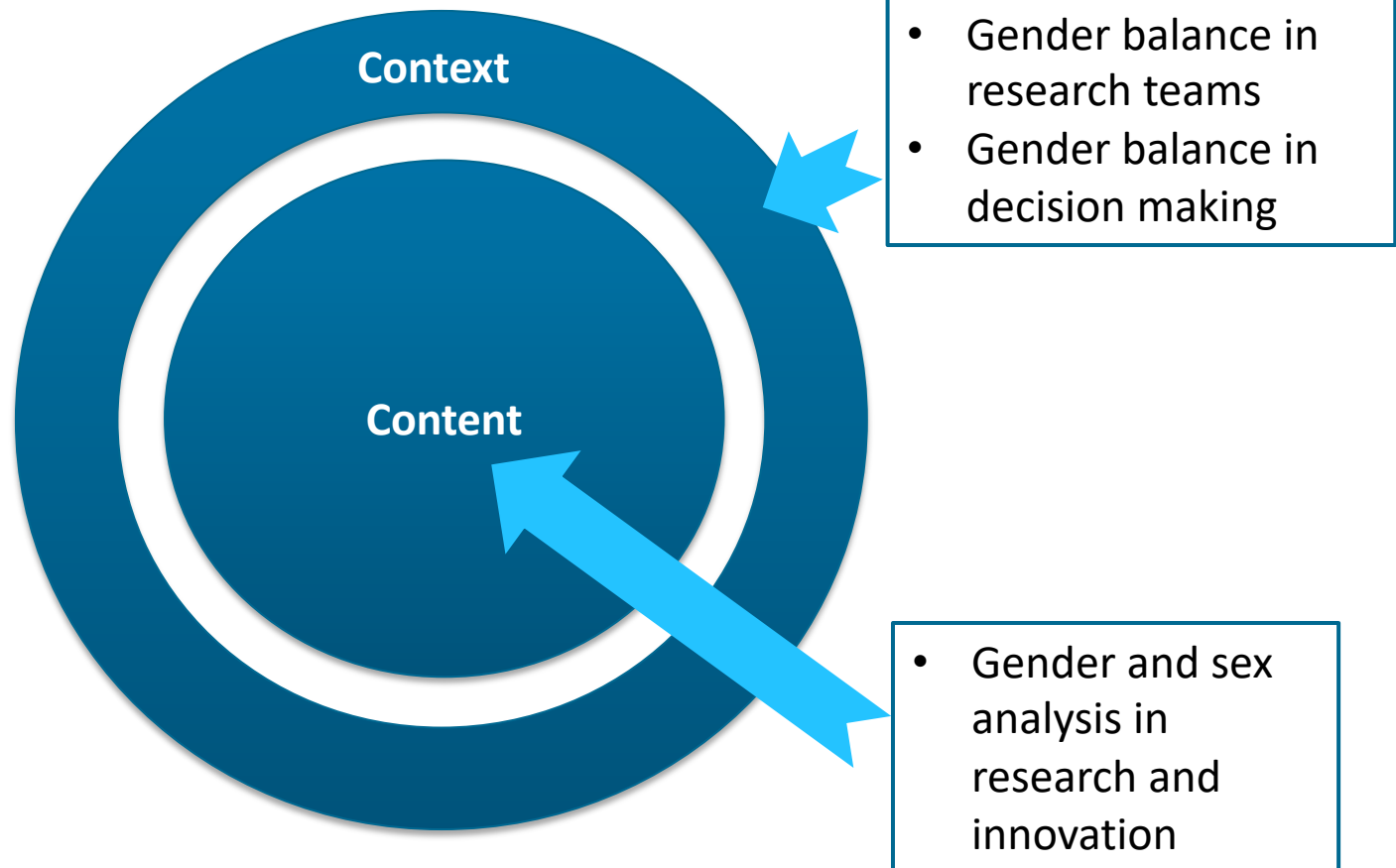
- *Fostering gender balance in Horizon 2020 research teams,* in order to address the gaps in the participation of women in the Framework Programme's projects
- *Ensuring gender balance in decision-making,* in order to reach the Commission's target of 40% of the under-represented sex in panels and groups (50% for advisory Groups)
- *Integrating gender/sex analysis in research and innovation (R&I) content,* helps improve the scientific quality and societal relevance of the produced knowledge, technology and/or innovation.

These objectives are part of the Commission provisions for the implementation of Horizon 2020 and are integrated at each stage of the Research and Innovation cycle.

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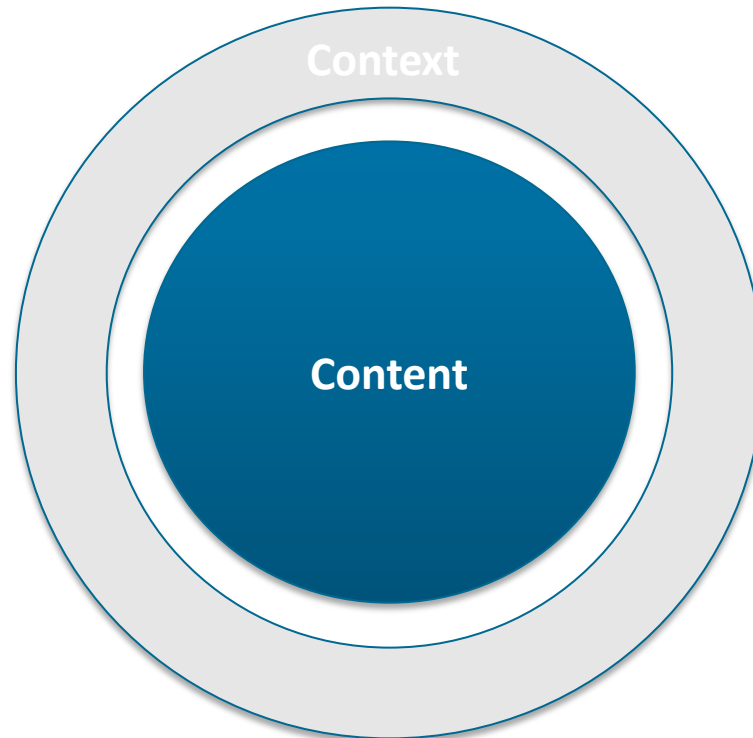
# About sex and gender in healthcare

## Content and context

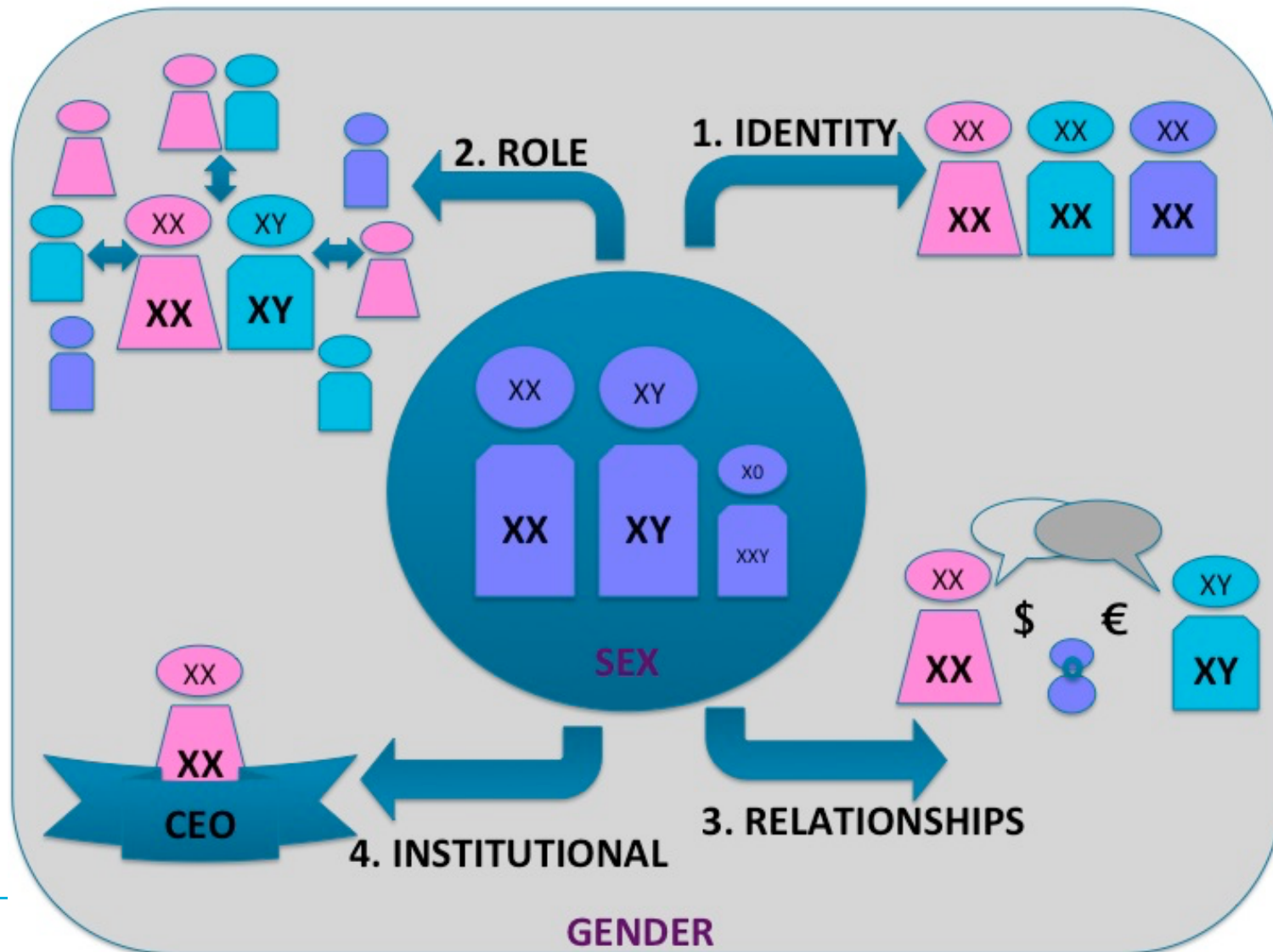


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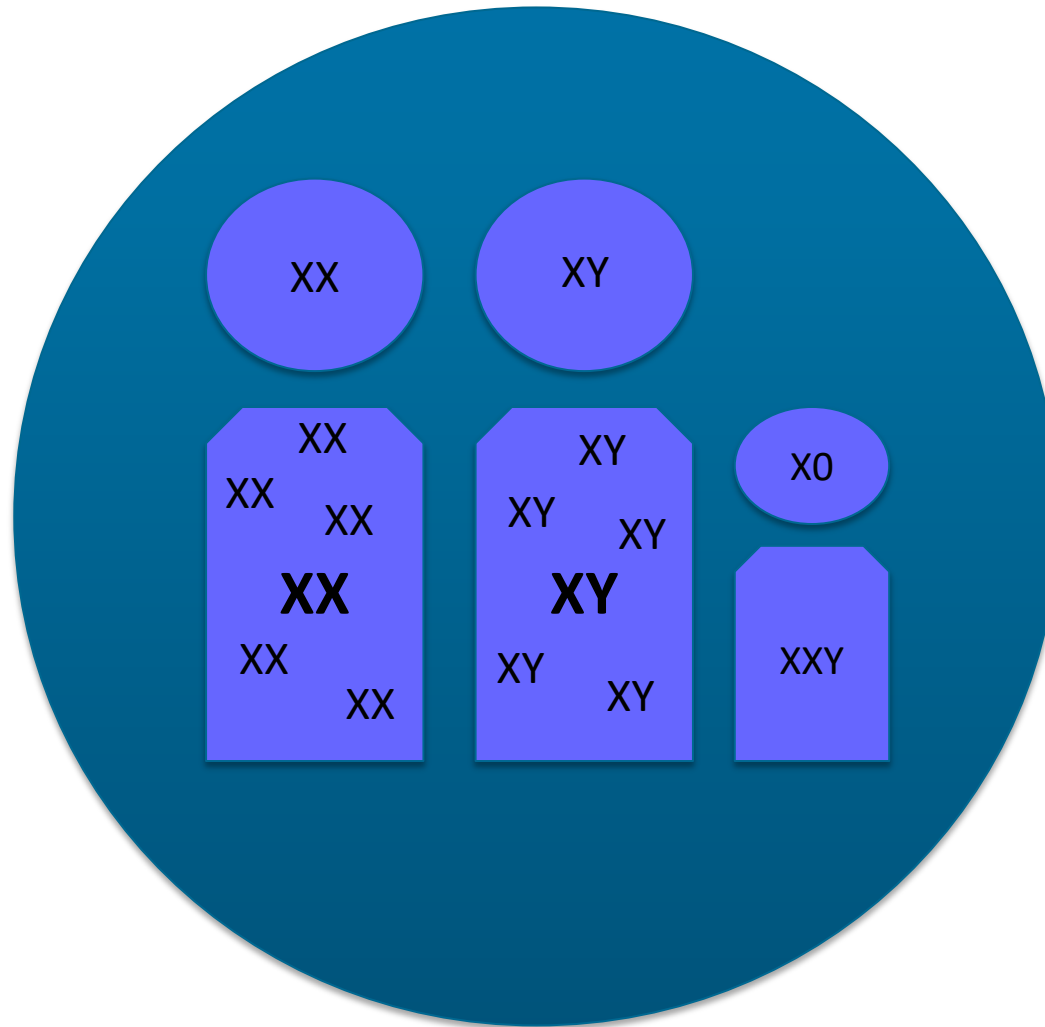
# Gender and sex analysis in research and innovation



# Sex and gender - terminology



# Every cell has a sex



## Sex differences: genes

**Radboudumc**  
Fish EN, Nat Rev Immunol, 2008  
Charchar FJ, The Lancet, 2012

# Sex differences: hormones

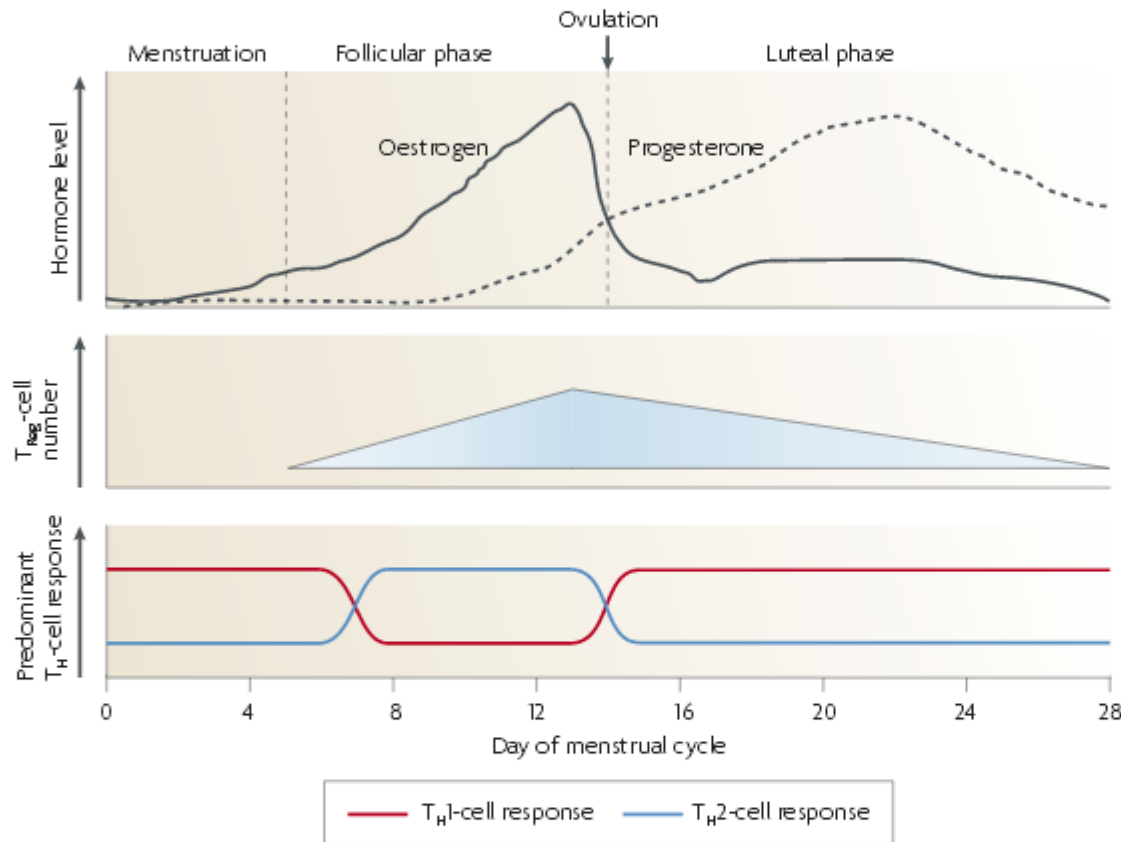
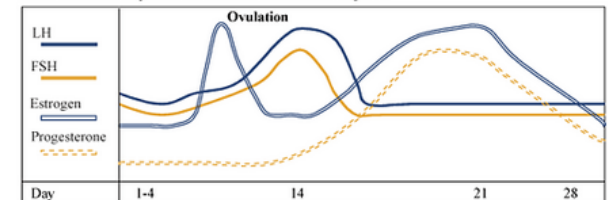


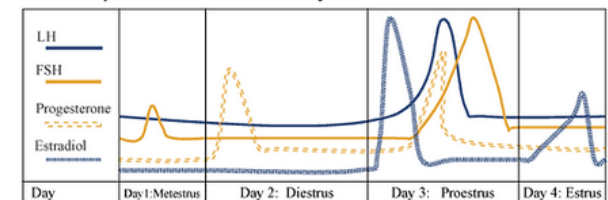
Figure 3 | Oestrogen and progesterone effects on T-cell responses during the menstrual cycle. Variations in oestrogen and progesterone levels during the different phases of the menstrual cycle influence Thelper 1 ( $T_H1$ )-,  $T_H2$ - and Tregulatory ( $T_{Reg}$ )-cell populations. The upper panel illustrates fluctuations in the levels of oestrogen and progesterone during the different phases of the 28-day menstrual cycle. In the middle and lower panels, the corresponding changes in the size of the  $T_{Reg}$ -cell population and the  $T_H$ -cell bias, respectively, are shown.



**A Human Reproductive Menstrual Cycle**



**B Rat Reproductive Menstrual Cycle**



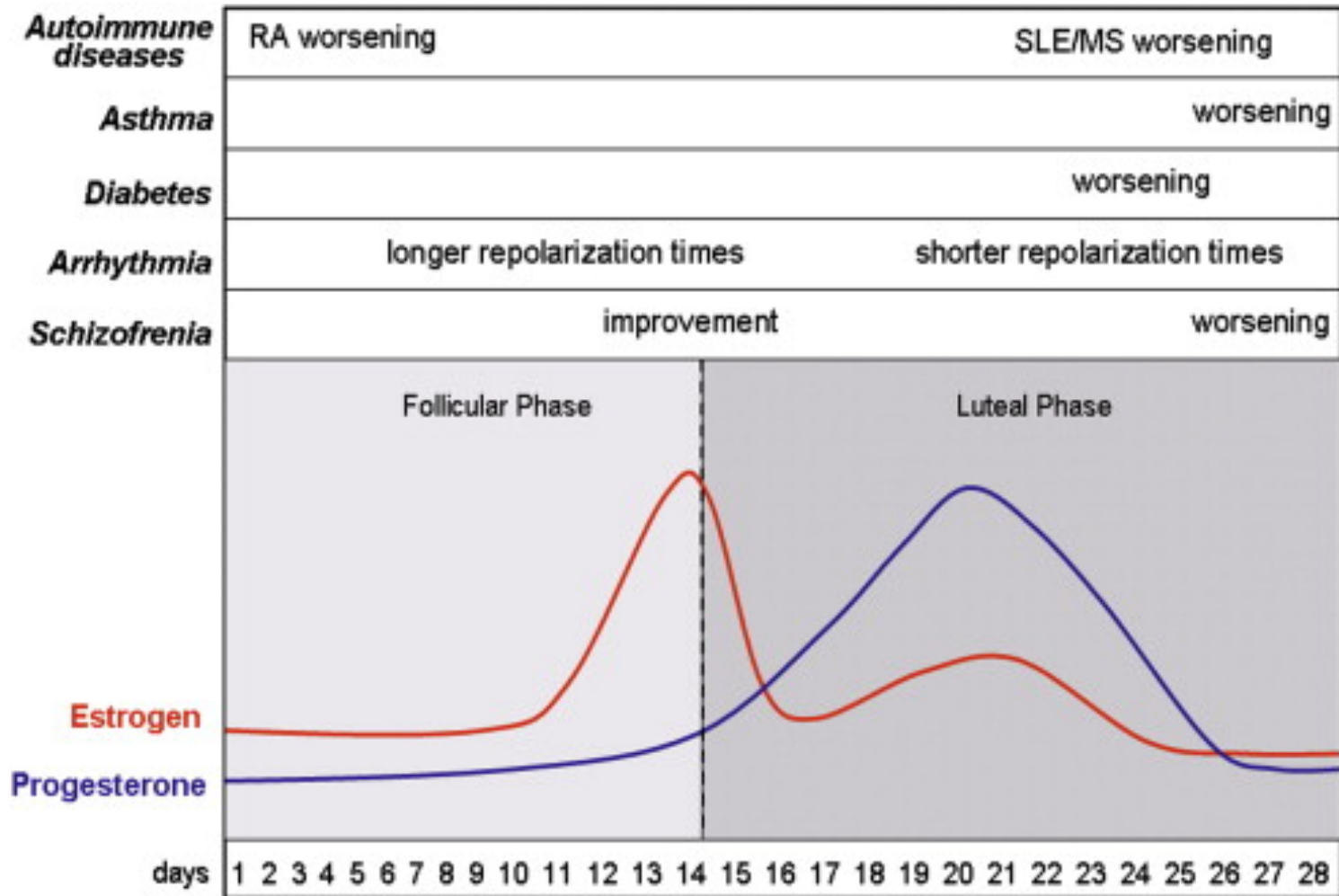
Prendergast BJ, Neurosci Biobehav Rev, 2014

Fish EN, Nature Rev Immunol, 2008

Emanuele MA, NIAAA Publications, 2003



# Sex differences: hormones and disease

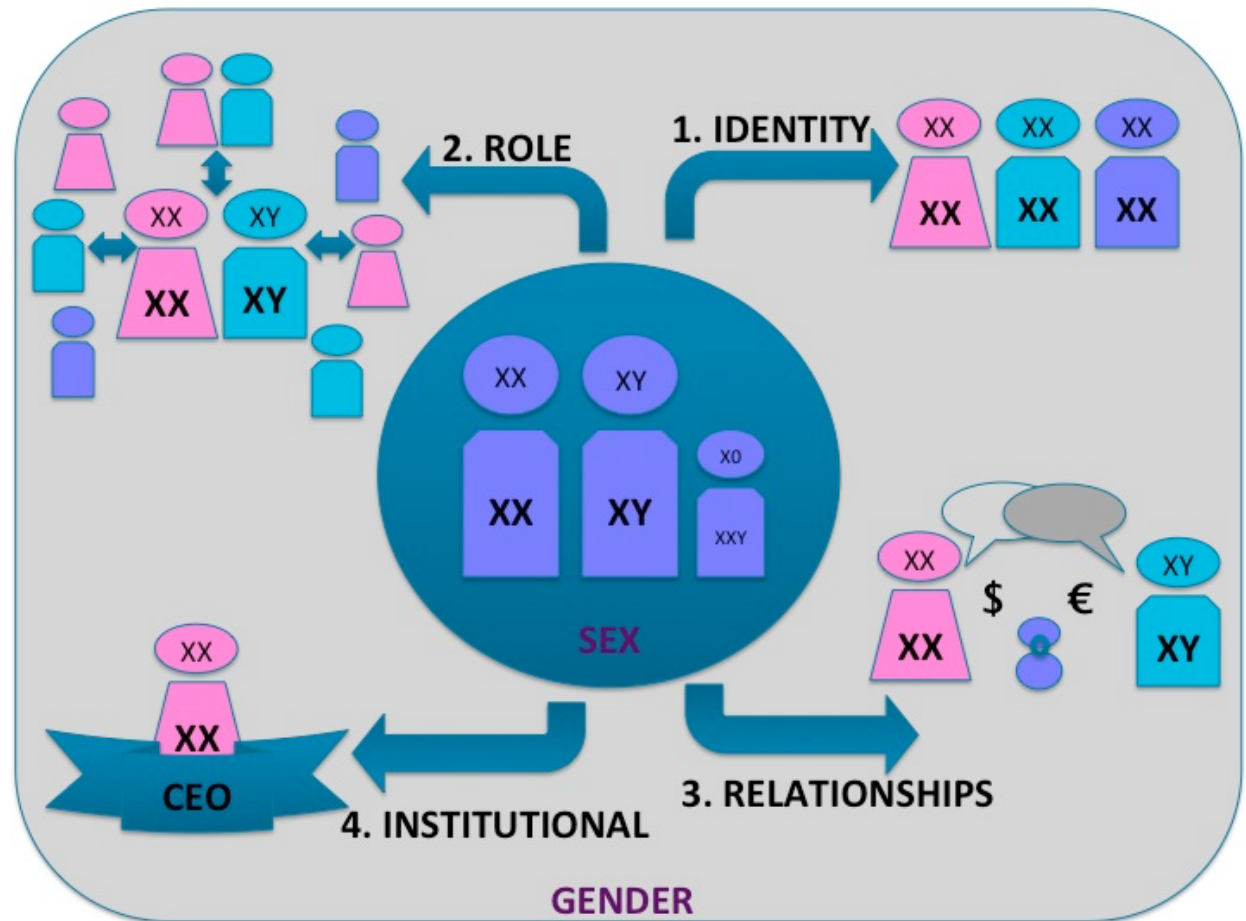


# Mesuring gender: a concept from the social sciences in medicine

Four dimensions:

- Identity
- Role
- Relationships
- Institutional

Being vs Doing



# Mesuring gender identity: a concept from the social sciences in medicine

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SANDRA L. BEM

TABLE 1  
ITEMS ON THE MASCULINITY, FEMININITY, AND SOCIAL DESIRABILITY SCALES OF THE BSRI

Masculine items	Feminine items	Neutral items
49. Acts as a leader	11. Affectionate	51. Adaptable
46. Aggressive	5. Cheerful	36. Conceited
58. Ambitious	50. Childlike	9. Conscientious
22. Analytical	32. Compassionate	60. Conventional
13. Assertive	53. Does not use harsh language	45. Friendly
10. Athletic	35. Eager to soothe hurt feelings	15. Happy
55. Competitive	20. Feminine	3. Helpful
4. Defends own beliefs	14. Flatterable	48. Inefficient
37. Dominant	59. Gentle	24. Jealous
19. Forceful	47. Gullible	39. Likable
25. Has leadership abilities	56. Loves children	6. Moody
7. Independent	17. Loyal	21. Reliable
52. Individualistic	26. Sensitive to the needs of others	30. Secretive
31. Makes decisions easily	8. Shy	33. Sincere
40. Masculine	38. Soft spoken	42. Solemn
1. Self-reliant	23. Sympathetic	57. Tactful
34. Self-sufficient	44. Tender	12. Theatrical
16. Strong personality	29. Understanding	27. Truthful
43. Willing to take a stand	41. Warm	18. Unpredictable
28. Willing to take risks	2. Yielding	54. Unsystematic

*Note.* The number preceding each item reflects the position of each adjective as it actually appears on the Inventory.

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# Mesuring gender:

## a concept from the social sciences in medicine

- (1) primary earner in the household,
- (2) personal income,
- (3) numbers of hours per week spent doing housework,
- (4) status of primary person responsible for doing housework,
- (5) level of stress at home,
- (6) Bem Sex Role Inventory masculinity score, and
- (7) Bem Sex Role Inventory femininity score.

The gender-related score represents the probability (between 0% and 100%) for each patient to be a “woman”. The lower the reported score, the more the patient reported characteristics traditionally ascribed to men and the higher the score, the more the patient reported characteristics ascribed to being a woman. Intermediate scores represent patients with an equivalent level of characteristics traditionally ascribed to women and men.

A screenshot of a Google search for "heart attack". The search bar at the top contains the text "heart attack". Below the search bar, there are tabs for "Alle", "Bilder" (selected), "Videos", "News", "Maps", "Mehr", "Einstellungen", and "Tools". On the right side, there are links for "Gespeicherte Inhalte ansehen" and "SafeSearch". Below the tabs, there are two filters: "coronary" and "chest". The main area displays a grid of 15 images related to heart attacks. The images show various people experiencing chest pain, with some holding their chests, some with visible ECG lines, and some with anatomical diagrams of the heart and arteries. The images are arranged in three rows of five.

Of the first 100 Google images about „heart attack“ 4 are women....

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## Potential consequences

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# Consequences of ignoring sex differences I:

## Reduced reproducibility

We found that exposure of mice and rats to male but not female experimenters produces pain inhibition. Male-related stimuli induced a robust physiological stress response that results in stress-induced analgesia. This effect could be replicated with T-shirts worn by men, bedding material from gonadally intact and unfamiliar male mammals, and presentation of compounds secreted from the human axilla.

**Experimenter sex can thus affect apparent baseline responses in behavioral testing.**



# Consequences of ignoring sex/gender differences II:

## Delayed diagnosis

Diagnosis in women with bladder cancer and haematuria is more likely delayed because attributed to cystitis

Although women refer more symptoms of asthma, they are less likely diagnosed. In girls wheezing is less common than in boys

Men are diagnosed later with osteoporosis and autoimmune diseases, because these are perceived as „female“

If not diagnosed correctly, men with MS are more likely referred to an orthopedic surgeon, women to a psychiatrist.

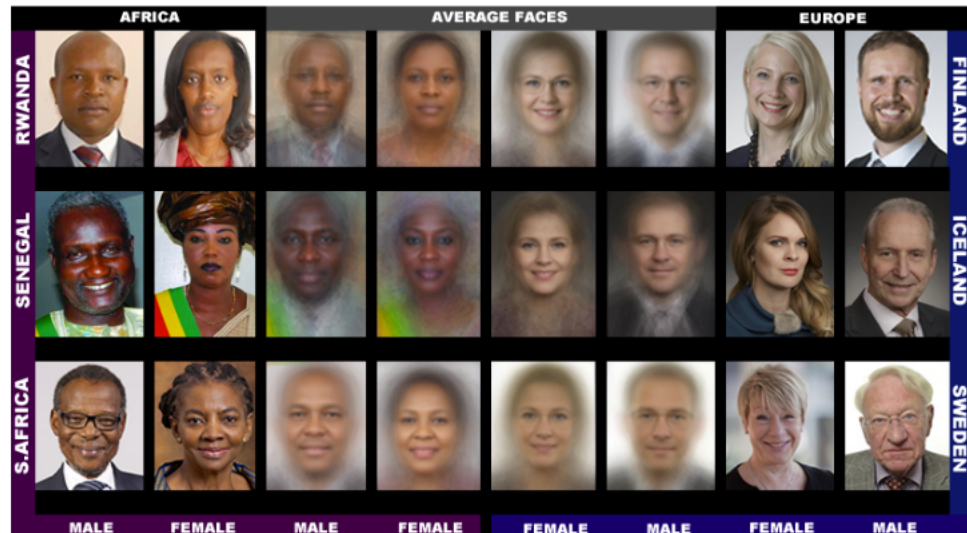




# Consequences of ignoring sex/gender differences III:

## Algorithm bias

Likelihood of being misclassified or not recognized by commercial algorithms according to gender and skin color



	All	Female	Male	Darker	Lighter	DF	DM	LF	LM
<b>MSFT</b>									
Error Proportion	-	76.9%	23.1%	93.6%	6.4%	70.5%	23.1%	6.4%	0.0%
Error Count	78	60	18	73	5	55	18	5	0
<b>FACE++</b>									
Error Proportion	-	95.9%	4.1%	74.0%	26.0%	72.4%	1.6%	23.6%	2.4%
Error Count	123	118	5	91	32	89	2	29	3
<b>IBM</b>									
Error Proportion	-	74.7%	25.3%	85.7%	14.3%	61.0%	24.7%	13.6%	0.6%
Error Count	154	115	39	132	22	94	38	21	1

# Consequences of ignoring sex differences IV:

## Mortality due to increase of unexpected side effects

TABLE 1. PRESCRIPTION DRUGS WITHDRAWN FROM UNITED STATES MARKET, JANUARY 1, 1997–DECEMBER 31, 2000

<i>Drug</i>	<i>Type of drug</i>	<i>Date approved</i>	<i>Date withdrawn</i>	<i>Primary health risk</i>
Pondimin (fenfluramine hydrochloride)	Appetite suppressant	6/14/1973	9/15/1997	Valvular heart disease
Redux (dexfenfluramine hydrochloride)	Appetite suppressant	4/29/1996	9/15/1997	Valvular heart disease
Seldane (terfenadine)	Antihistamine	5/8/1985	2/27/1998	Torsades de pointes
Posicor (mibefradil dihydrochloride)	Cardiovascular	6/20/1997	6/8/1998	Bradycardia in elderly and adverse drug interaction
Hismanal (astemizole)	Antihistamine	12/19/1988	6/18/1999	Torsades de pointes
Rezulin (troglitazone)	Diabetic	1/29/1997	3/21/2000	Liver failure
Propulsid (cisapride monohydrate)	Gastrointestinal	7/29/1993	7/14/2000	Torsades de pointes
Lotronex (alosetron hydrochloride)	Gastrointestinal	2/9/2000	11/28/2000	Ischemic colitis
Raxar (grepafloxacin hydrochloride)	Antibiotic	11/6/1997	11/1/1999	Torsades de pointes
Durac (bromfenac sodium)	Analgesic and anesthetic	7/15/1997	6/22/1998	Liver failure

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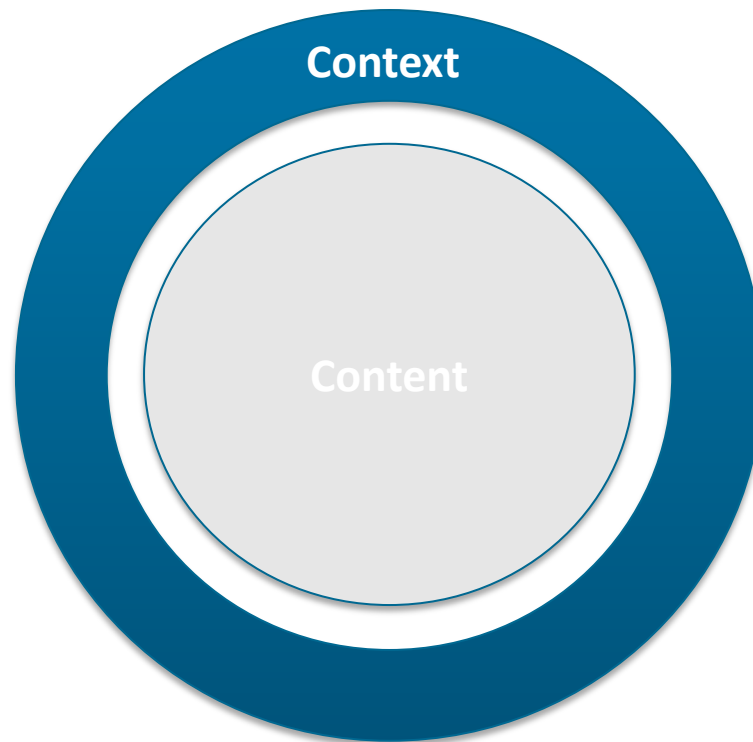
## Essential steps towards mitigation

1. Obtain information about your samples
2. Include (at least) both sexes / think about the conceptualization of gender
3. Consult an expert
4. Disaggregate data
5. Stratify analysis by sex / gender
6. Report data in disaggregated format
7. Spread the word

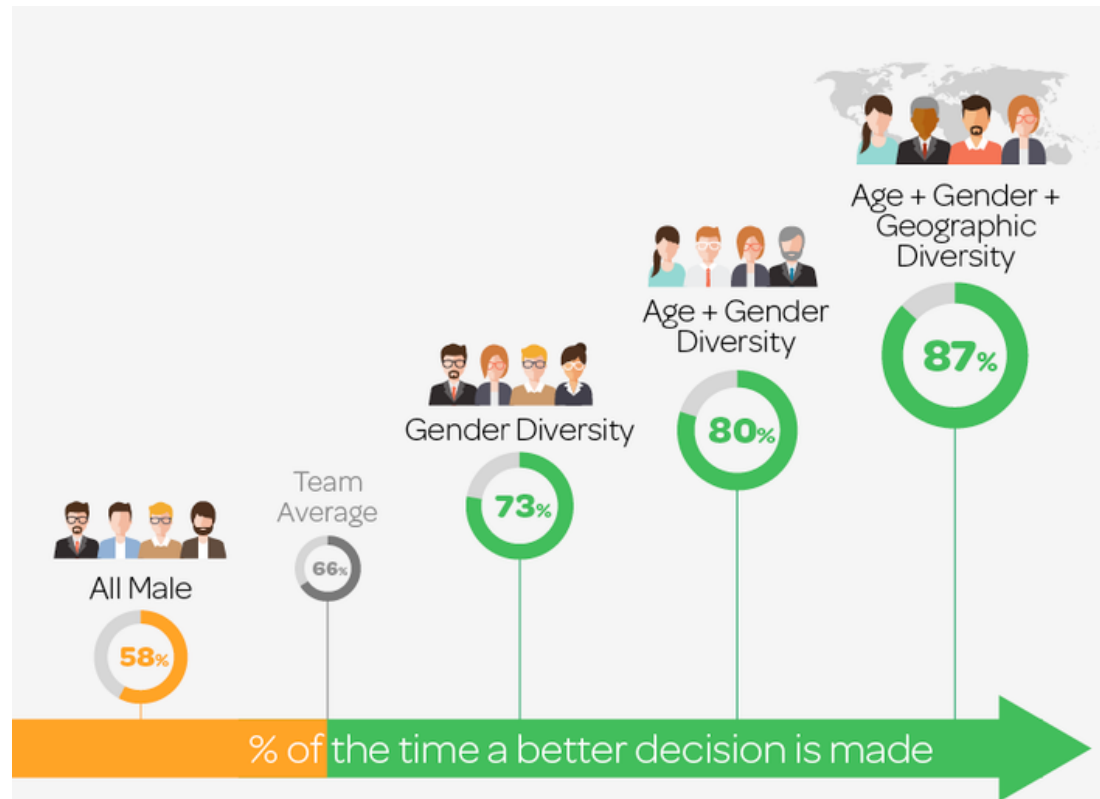
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# Gender balance in research teams

## Gender balance in decision making



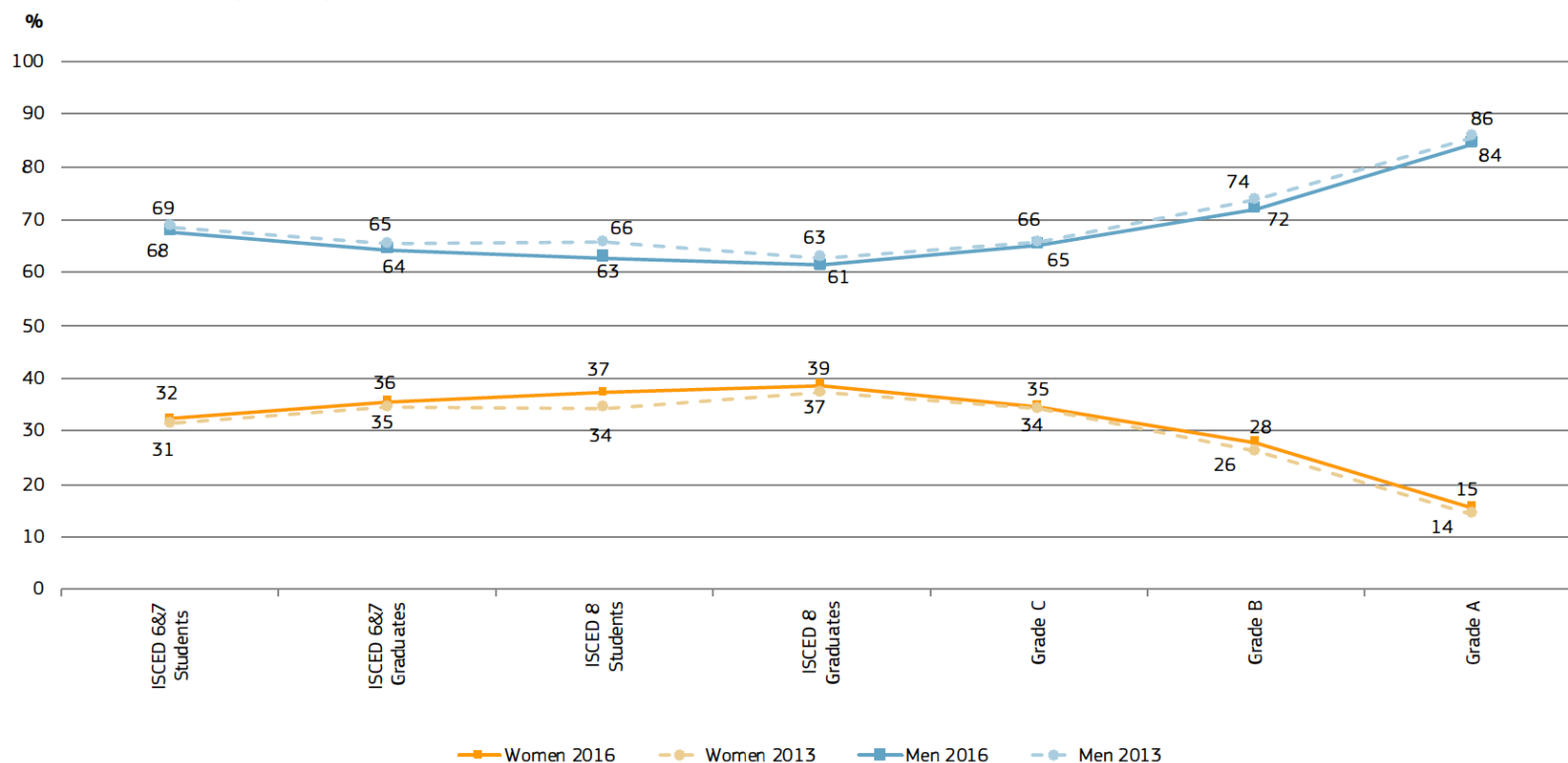
# Diversity leads to better decisions



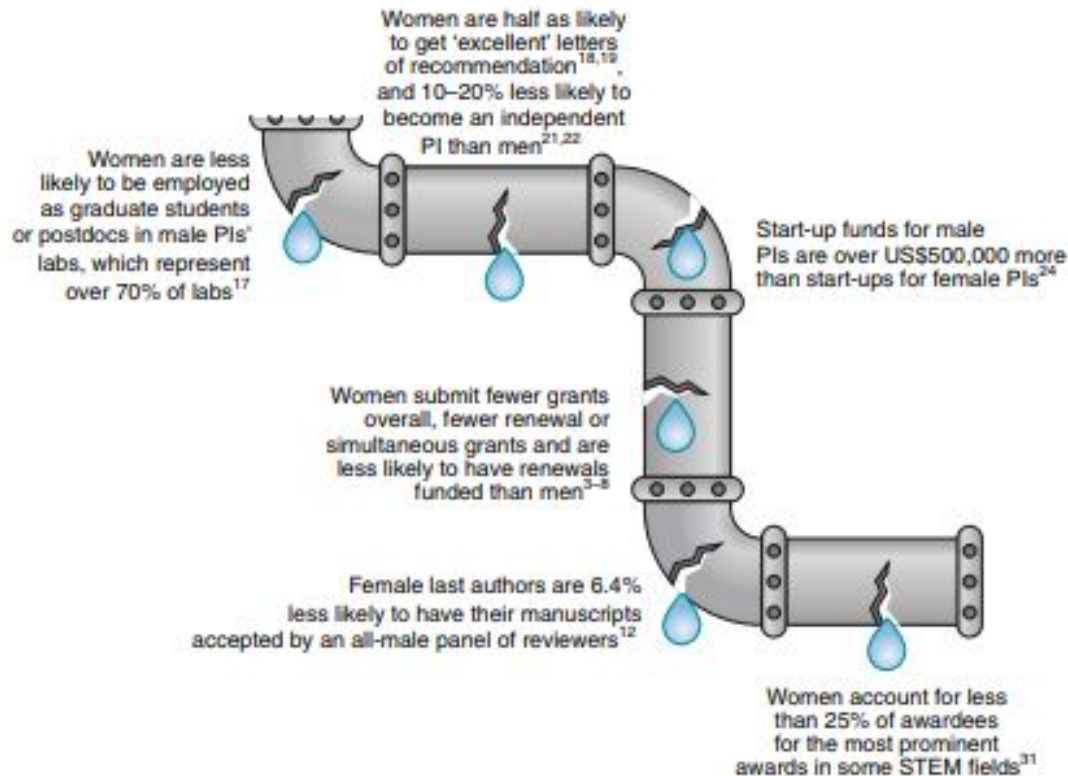
Diverse teams make better decisions up to **87%** of the time.

# Gendered discrimination of researchers

**Figure 6.2** Proportion (%) of men and women in a typical academic career in science and engineering, students and academic staff, EU-28, 2013-2016



# Leaky pipeline



**Fig. 1 | The leaky pipeline of women in STEM.** The 'leaky pipeline' often depicts women passively leaking out of STEM careers with no discussion of why those leaks occur, but, in fact, the cracks and gaps caused by the biases and barriers are a major cause of the leak of women and minorities out of the STEM pipeline. PI, principal investigator. Credit: Gvais/Shutterstock (pipes and water), 32 pixels/Shutterstock (spanner and wrench).

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## It's the women...

„It does appear that on many, many different human attributes -- height, weight, propensity for criminality, overall IQ, mathematical ability, scientific ability -- there is relatively clear evidence that whatever the difference in means -- which can be debated -- there is a difference in the standard deviation, and variability of a male and a female population. ...“ Laurence Summers, 2005, then Dean of Harvard University



# Ben Barres

Vol 442 | 13 July 2006

nature

## COMMENTARY



### Does gender matter?

The suggestion that women are not advancing in science because of innate inability is being taken seriously by some high-profile academics. Ben A. Barres explains what is wrong with the hypothesis.

When I was 14 years old, I had an unusually talented maths teacher. One day after school, I excitedly pointed him out to my mother. To my amazement, she looked at him with shock and said with disgust: "You never told me that he was black." I looked over at my teacher and, for the first time, realized that he was an African-American. I had somehow never noticed his skin colour before, only his spectacular teaching ability. I would like to think that my parents' sincere efforts to teach me prejudice were unsuccessful. I don't know why this lesson takes for some and not for others. But now that I am 51, as a female-to-male transgendered person, I still wonder about it, particularly when I hear male gym teachers telling young boys "not to be like girls" in that same derogatory tone.

#### Hypothesis testing

Last year, Harvard University president Larry Summers suggested that differences in innate aptitude rather than discrimination were more likely to be to blame for the failure of women to advance in scientific careers<sup>1</sup>. Harvard professor Steven Pinker then put forth a similar

argument in an online debate<sup>2</sup>, and an almost identical view was elaborated in a 2006 essay by Peter Lawrence entitled 'Men, Women and Ghosts in Science<sup>3</sup>'. Whereas Summers prefaced his statements by saying he was trying to be provocative, Lawrence did not. Whereas Summers talked about "different availability of aptitude at the high end," Lawrence talked about average aptitudes differing. Lawrence argued that, even in a utopian world free of

*"Few tragedies can be more extensive than the stunting of life, few injustices deeper than the denial of an opportunity to strive or even to hope, by a limit imposed from without, but falsely identified as lying within."*

— Stephen Jay Gould

bias, women would still be under-represented in science because they are innately different from men.

Lawrence draws from the work of Simon Baron-Cohen<sup>4</sup> in arguing that males are 'on average' biologically predisposed to systematize,

to analyse and to be more forgetful of others, whereas females are 'on average' innately designed to empathize, to communicate and to care for others. He further argues that men are innately better equipped to aggressively compete in the 'vicious struggle to survive' in science. Similarly, Harvard professor or Harvey Mansfield states in his new book, *Manliness*<sup>5</sup>, that women don't like to compete, are risk adverse, less abstract and too emotional.

I will refer to this view — that women are not advancing because of innate inability rather than because of bias or other factors — as the Larry Summers Hypothesis. It is a view that seems to have resonated widely with male, but not female, scientists. Here, I will argue that available scientific data do not provide credible support for the hypothesis but instead support an alternative one: that women are not advancing because of discrimination. You might call this the 'Stephen Jay Gould Hypothesis' (see left). I have no desire to make men into villains (as Henry Kissinger once said, "Nobody will ever win the battle of the sexes; there's just too much fraternizing with the enemy"). As to who the practitioners of this bias are, I will be pointing my finger at women

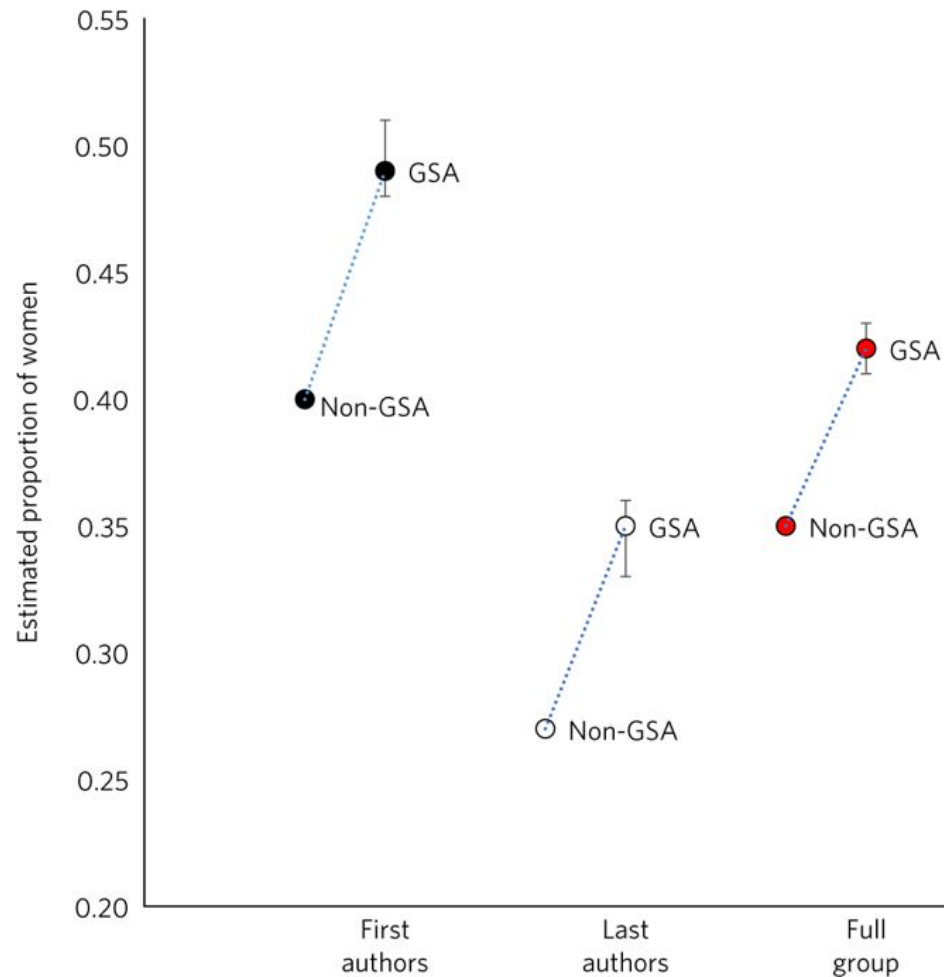


**"Ben Barres gave a great seminar today, but then his work is much better than his sister's."**

Radboudumc

Barres B, Nat, 2006

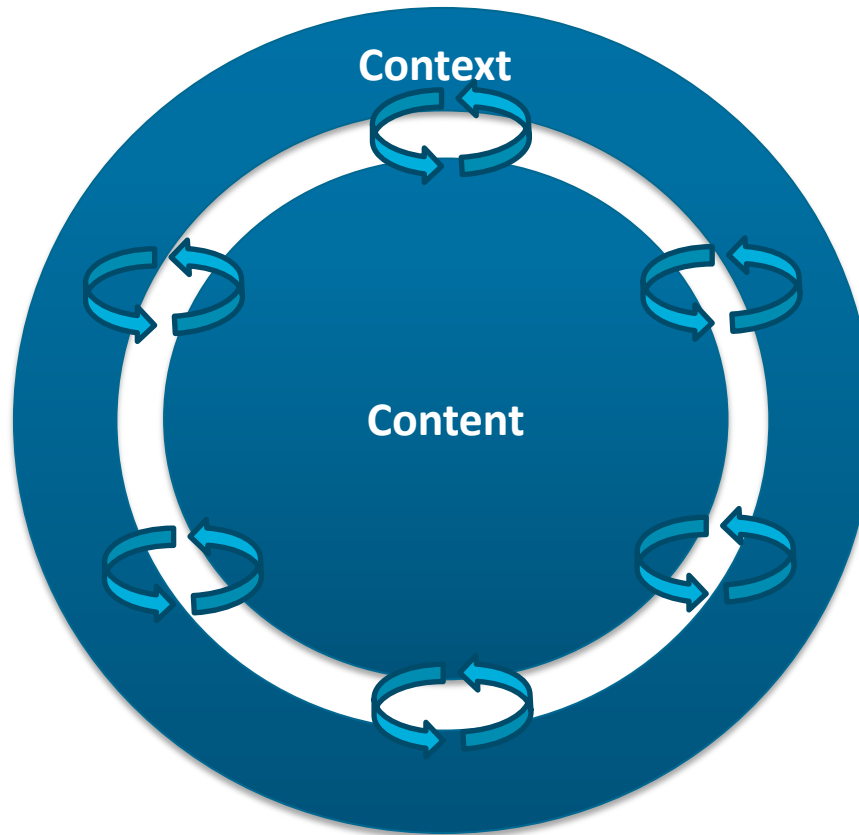
# Influence of the researcher on the researched topic



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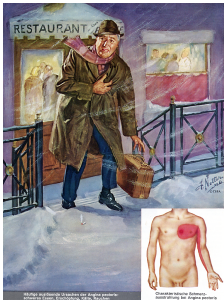
# The gender dimension

## Content and context



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## The way forward



# The story of the “female” heart attack – a systemic perspective

Increased death rates in young women

Reduced awareness in physician

Reduced awareness in women

Investigation of symptoms

Campaigns: Go Red for Women

Women’s sections within Cardiological  
Societies

FDA Office on Women’s Health

NIH mandates inclusion of information  
about sex

Inclusion in teaching

Barbra Streisand and Laura Bush

Problem identification

Science to identify causes -  
provider

Science to identify causes -  
population

Science to identify causes -  
clinical

Awareness raising general  
public

Parallel organization

Official organization

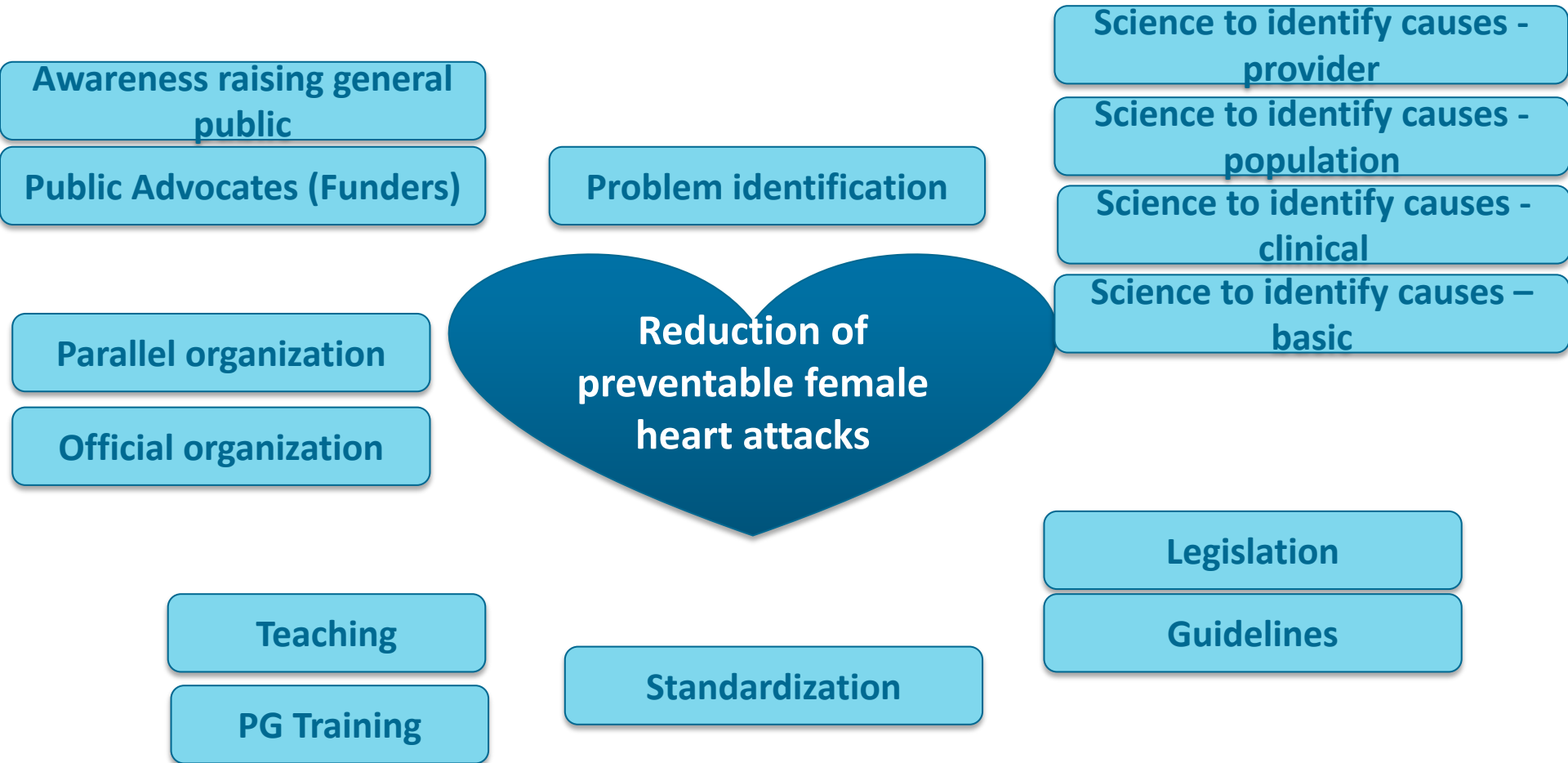
Inclusion by funding bodies

Teaching

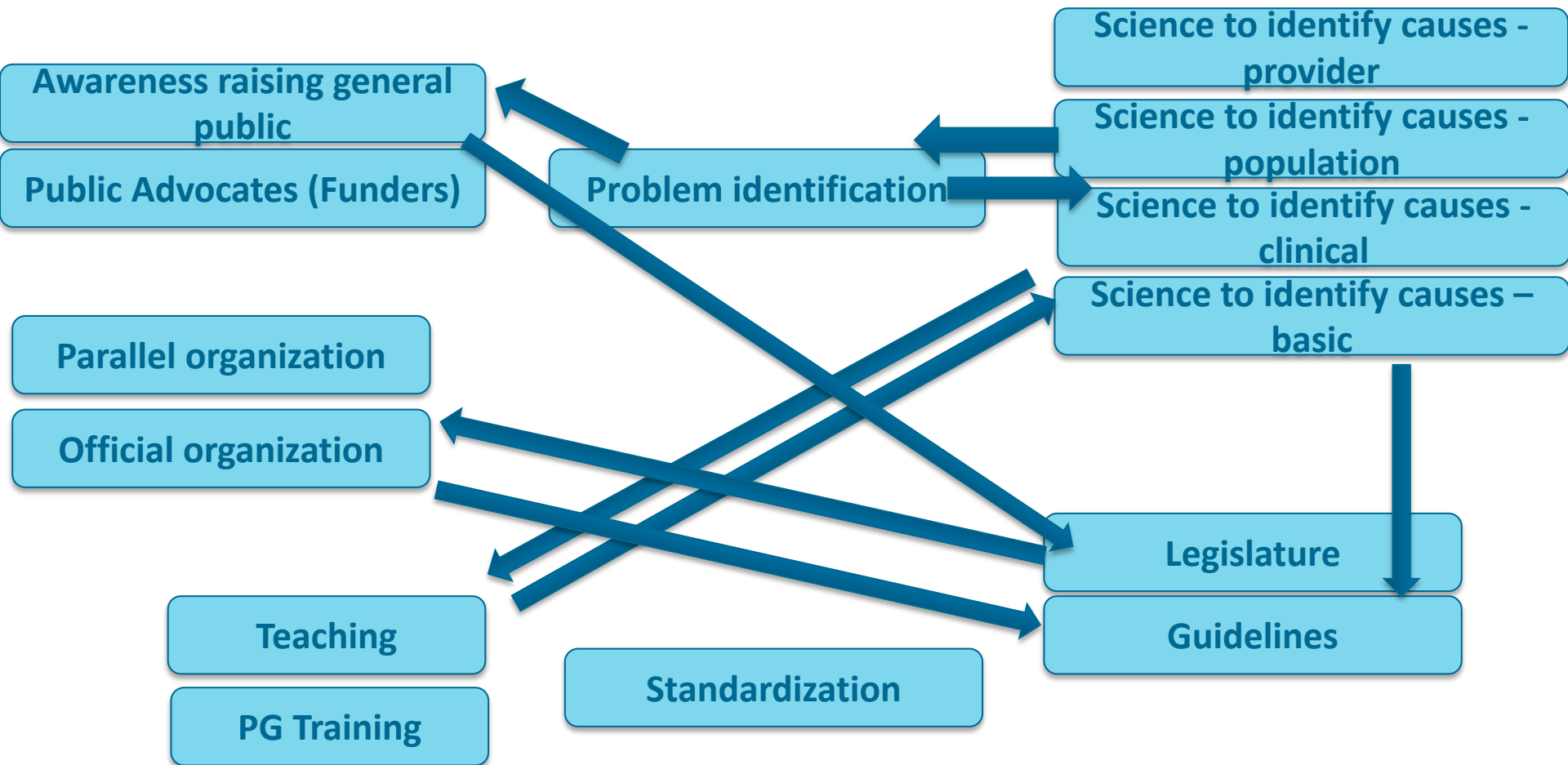
Public Advocates (Funders)

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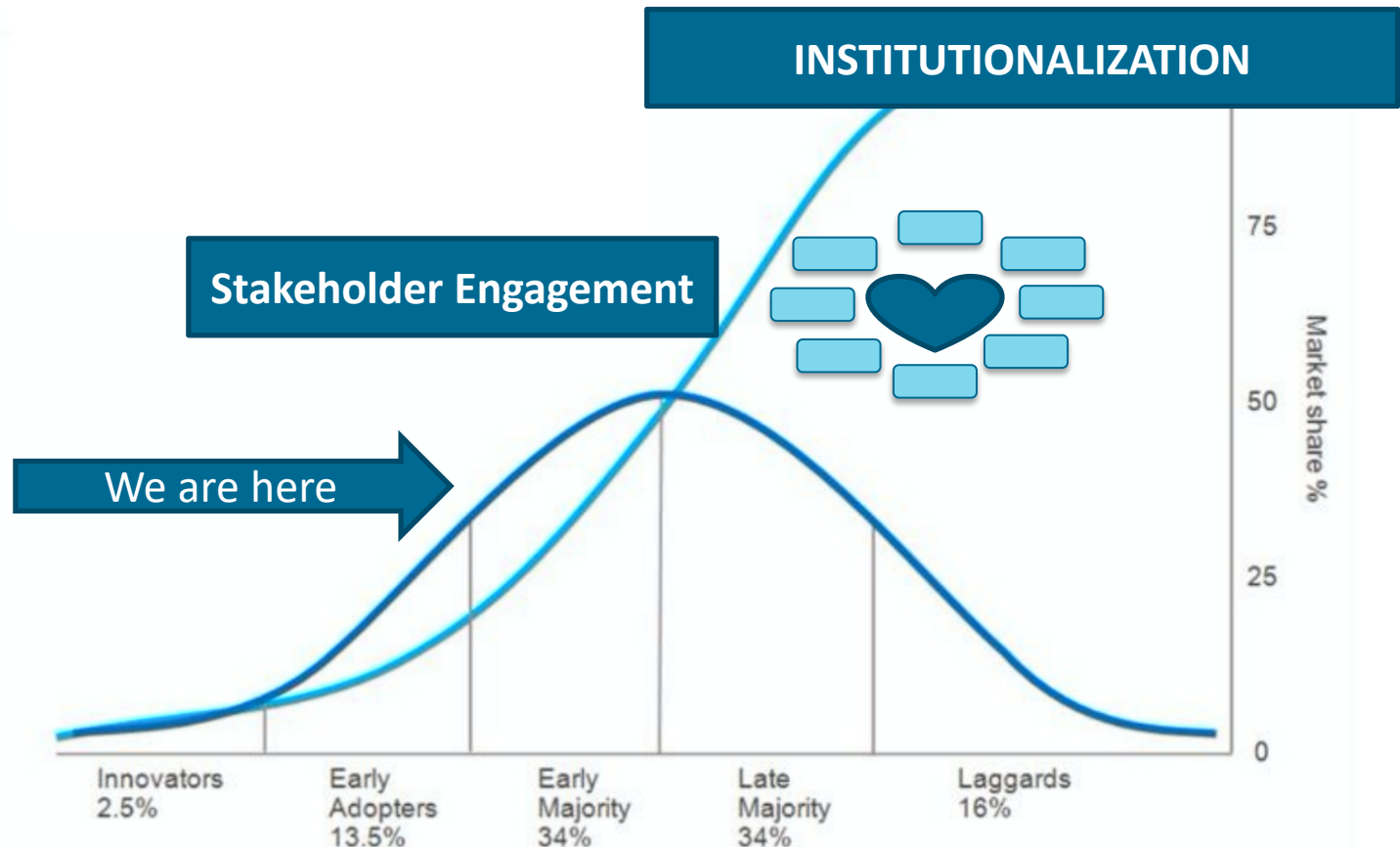
# Which elements were necessary?



# Which elements were necessary?



# The incorporation of the gender dimension is a change process





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# Thank you for your attention!

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 @smoertelt

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