Westcoast Women in Engineering, Science and Technology

Diversity-, Sex- and Gender-Based Analysis in Specific STEM Topics

Dr. Lesley Shannon, P.Eng
NSERC Chair for Women in Science and Engineering, BC/Yukon
Associate Professor, School of Engineering Science
Simon Fraser University

Gender Summit 11 Montreal, QC November 7, 2017

WWEST Westcoast Women in Engineering, Science and Technology

What is WWEST?

- Westcoast Women in Engineering, Science and Technology
- Operating Program for NSERC Chair for Women in Science and Engineering, BC/Yukon Region

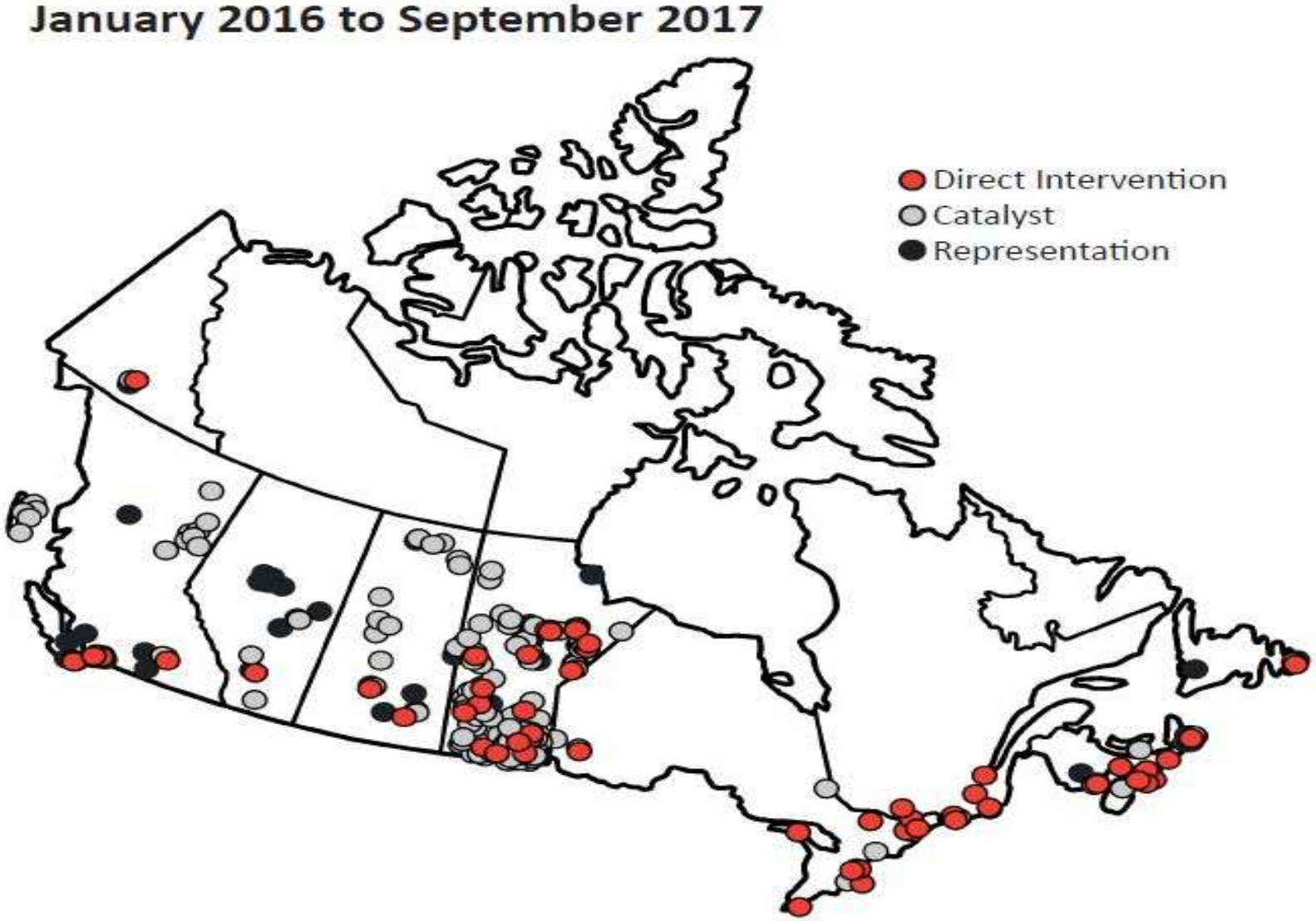
Dr. Lesley Shannon, P.Eng.

- Computer Engineer, School of Engineering Science, SFU

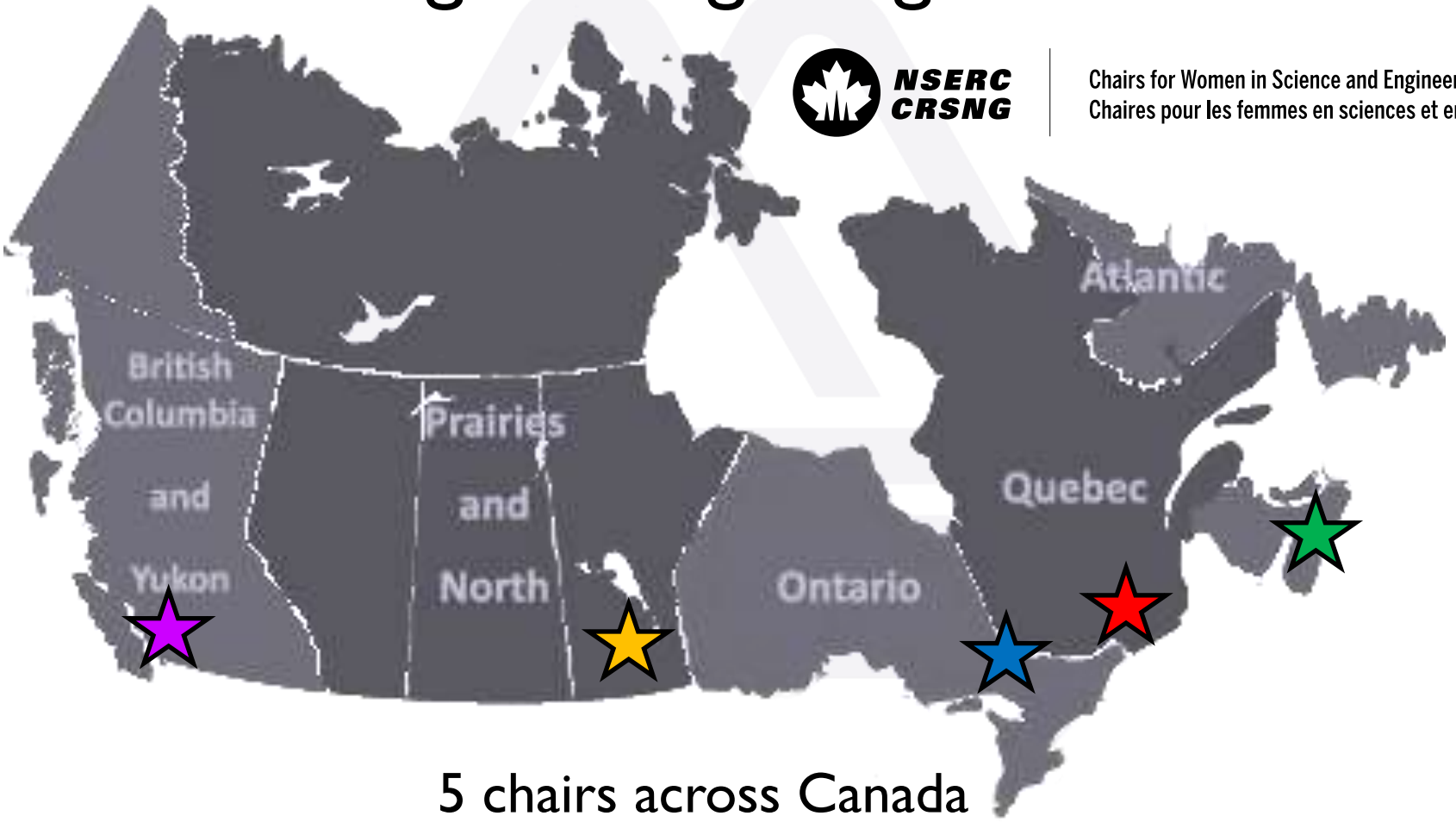
My Research:

- The design, abstraction and resource management of heterogeneous and custom computing systems

To empower and inform all Canadians



NSERC Chairs for Women in Science and Engineering Program



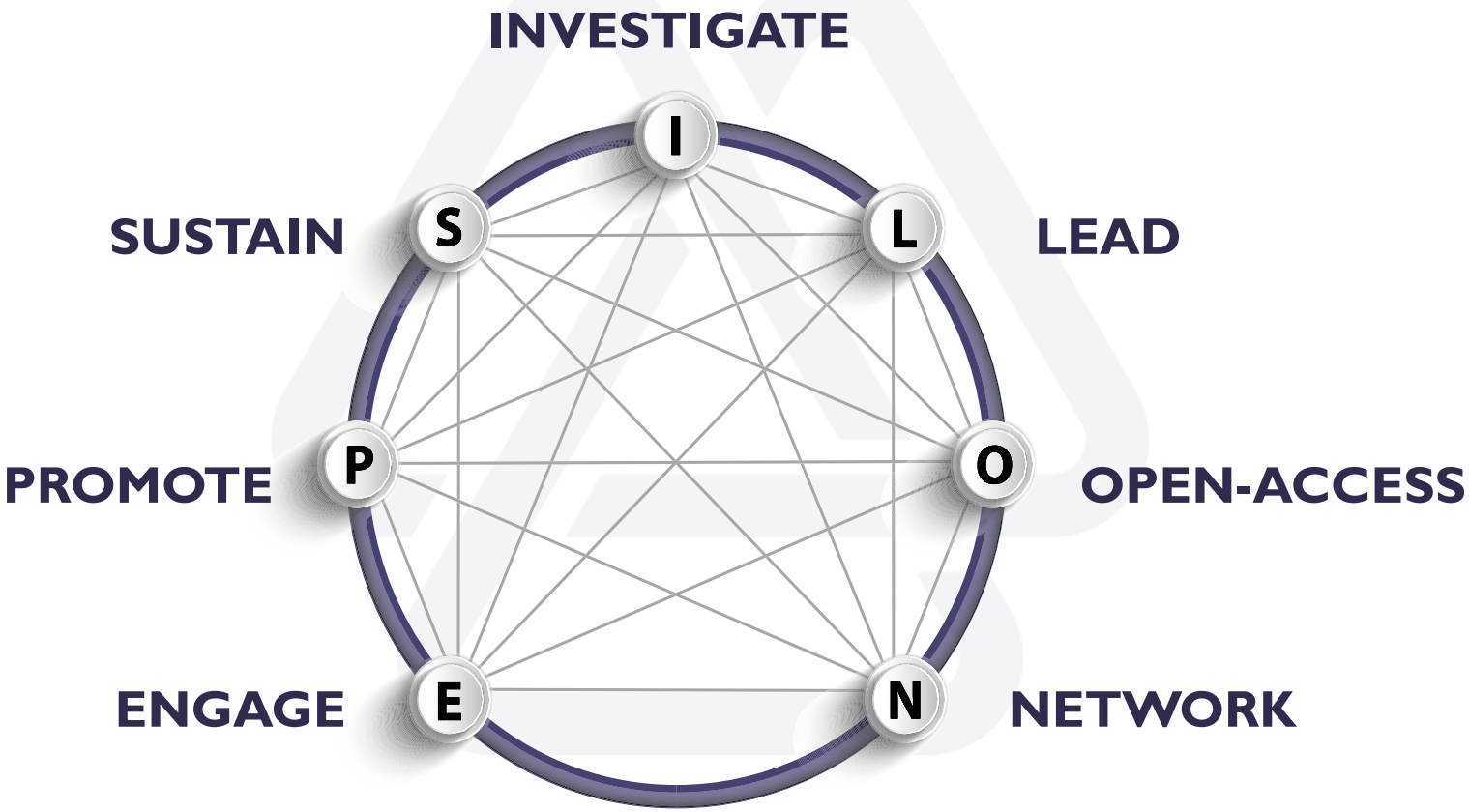
5 chairs across Canada

Mission

- To promote science and engineering
- To engage students, industry, and the community
- To increase the awareness and participation of women and other under-represented groups in STEM*

*STEM = Science, Technology, Engineering, and Math

The EPSILON Strategy:



…small positive changes have a big impact

Why are Diversity, Sex, and Gender –Based Analysis needed for STEM Research?

- When people interact with services and products, the quality of the interaction can be impacted by their ***design***
- When product/service/research design does not consider diversity, sex, and gender, the resulting quality is ***lowered***
- For researchers, this is not about reduced market shares but the ***validity*** of the results

Example #1

- Most biomedical and clinical research has assumed that males can serve as the representative of the species
- This is despite differing susceptibility and risk for many medical conditions and differing responses to drugs and other interventions
- The 90's saw 8 out of 10 prescription drugs withdrawn from the US market because they caused statistically greater health risks for women.

Source: Kat Ely, "The World is Designed by Men," Medium.com https://medium.com/hh-design/the-world-is-designed-for-men-d06640654491

Example #2

Vulnerability of Female Drivers Involved in Motor Vehicle Crashes (US Population):

- Study showed that belt-restrained female drivers experienced ***47% higher injuries*** than belt-restrained male drivers in comparable motor vehicle accidents
- Recent federal regulations introduced compliance testing using female crash test dummies, but most of the design safety decisions are being made relying on medium sized male crash test dummy.

Source: Bose, Segui-Gomez, Crandall, "Vulnerability of Female Drivers Involved in Motor Vehicle Crashes: An Analysis of US Population at Risk," American Journal of Public Health, 2011; doi:10.2105/AJPH.2011.300275

Example #3

Is your office too cold?

- Algorithms that dictate temperature regulation in many office buildings were designed in the 1960s for a 154-pound male

- A 2004 Cornell Study found that increasing ambient office temperature from 20 to 25 degrees Celsius reduced typing errors by 44% and increased typing productivity by 150%."

Source: Kat Ely, "The World is Designed by Men," Medium.com https://medium.com/hh-design/the-world-is-designed-for-men-d06640654491

The Point

- Factors such as gender, sex, and diversity matter for much more than health research.

- Even in the applied sciences:
  - Mechanical systems
  - Environmental systems
  - Computer algorithm design

- If humans, or some aspect of their biology, interact with the research, diversity must be considered to ensure the validity of the results

Engaging and empowering all Canadians in STEM

Thank You!

AI and Machine Learning

Joëlle Pineau

Computer Science

McGill University

McGill

Importance of Gender Differences in Neurophysiological Research

Diversity-, Sex- and Gender-Based Analysis in Specific STEM

7 NOV 2017

Serge Marchand, Ph.D.

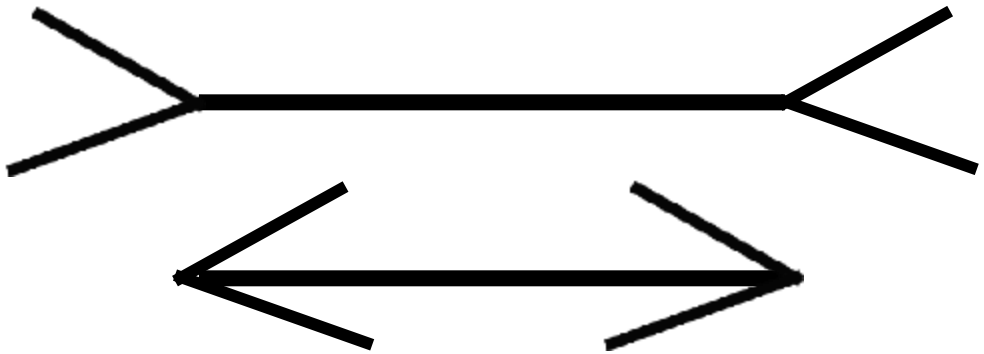
Centre hospitalier universitaire de Sherbrooke
Centre de recherche clinique Étienne-Le Bel

Fonds de recherche Santé Québec

Université de Sherbrooke
Faculté de médecine et des sciences de la santé

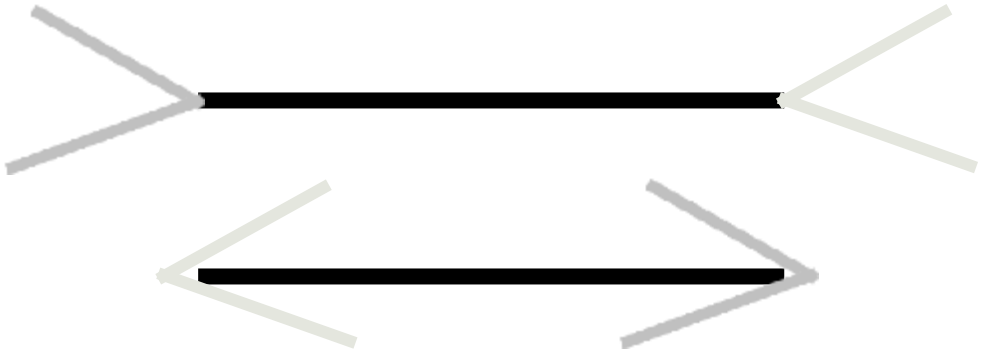
Psychophysics

Measuring the relationship between physical stimuli and our perception!



Top line longer ?

Psychophysics



Same length !

Psychophysics

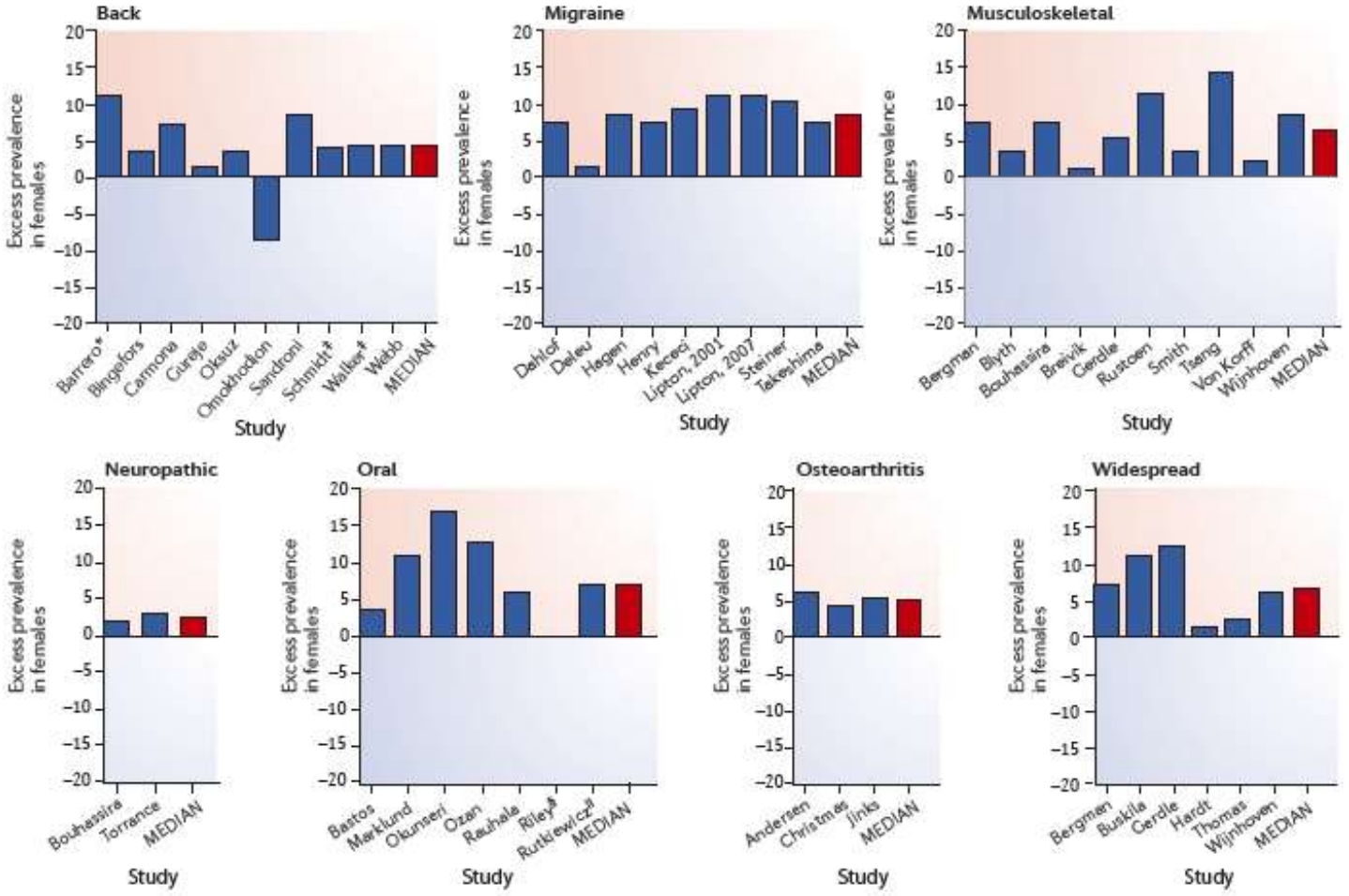
- **Taste, olfaction and touch are more developed in women than in men (Velle, 1987)**

Pain perception: **More developed in women !**

Sex differences in pain and pain inhibition: multiple explanations of a controversial phenomenon

Jeffrey S. Mogil

Clinical pain



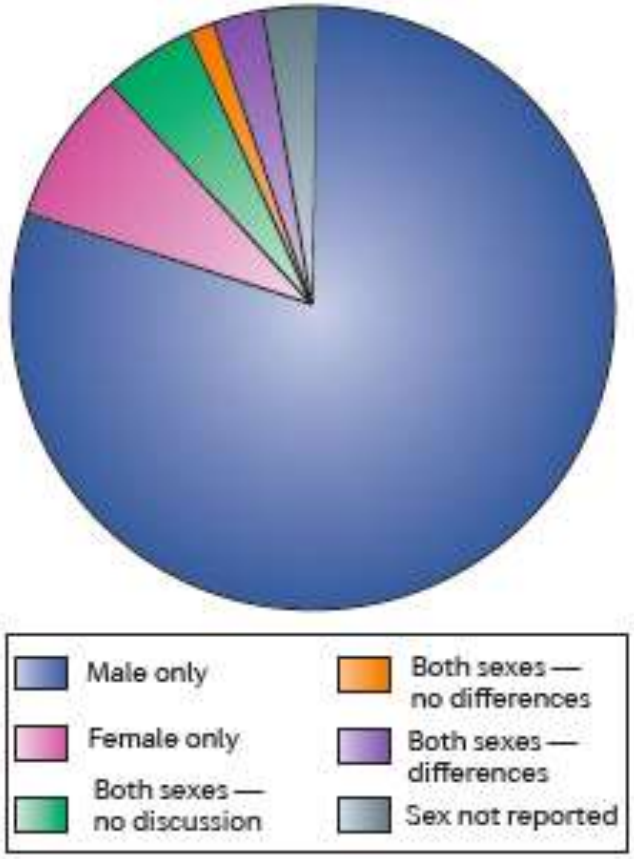
Sex differences in senses

- **Taste, olfaction and touch are more developed in women than in men (Velle, 1987)**

Pain perception: **More developed in women !**

Sex differences in pain and pain inhibition: multiple explanations of a controversial phenomenon

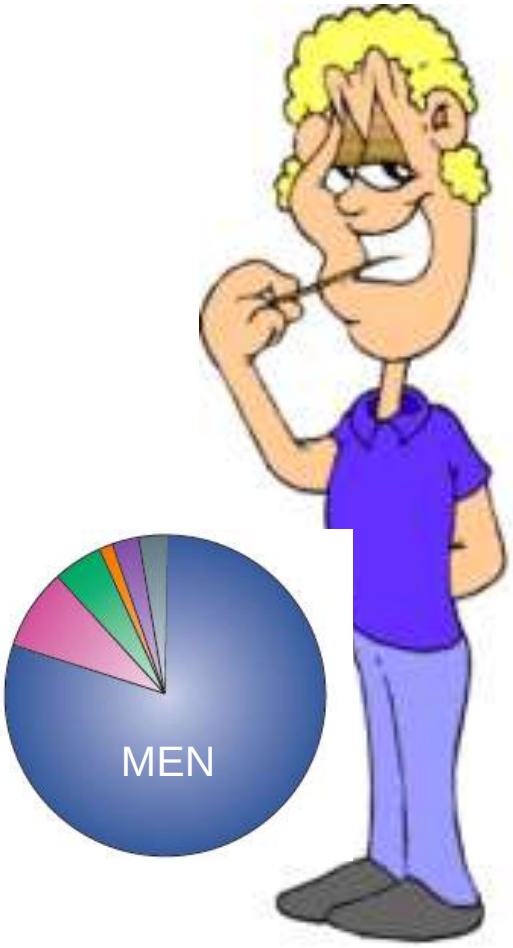
Jeffrey S. Mogil



Majority of studies have been done in males only !

Women are not small men !

Research and Treatments



The majority of pharmacological studies have been done in men!

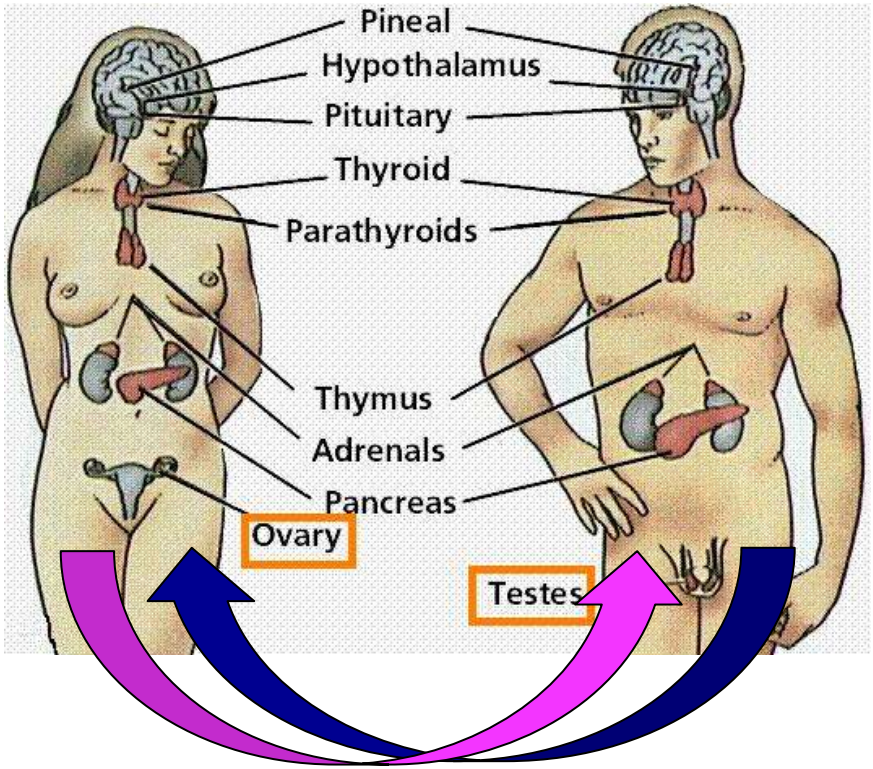
The dosage is adjusted for the subjects weight: Mg / kg

≠

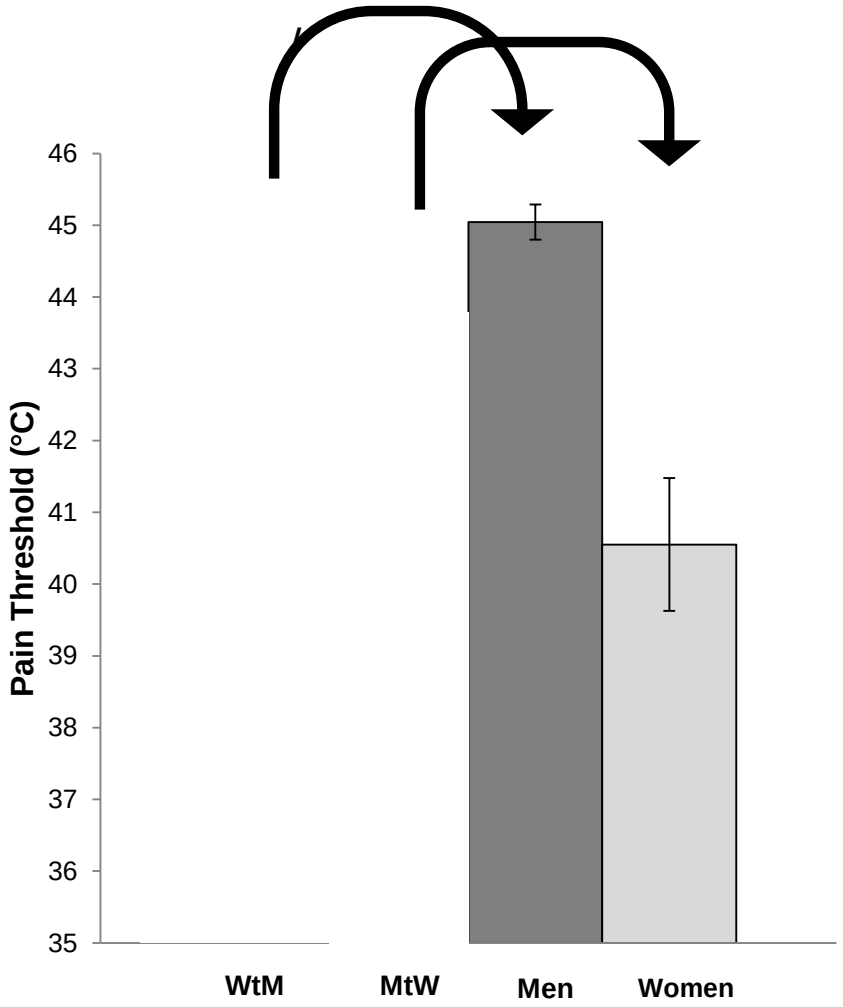
However Women are not small men !

Exchange of sex hormones ?

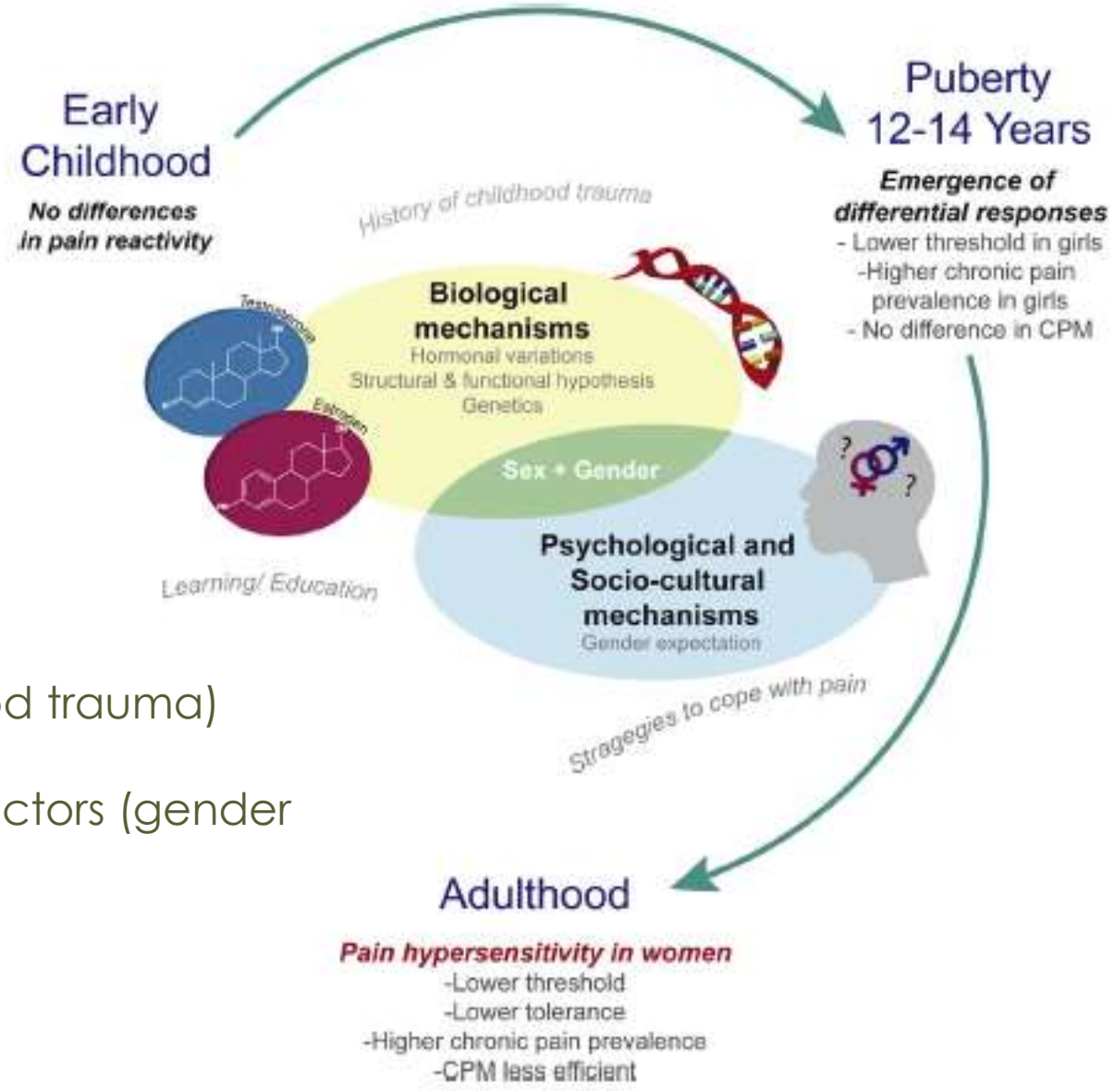
Sex reassignment therapy and Pain



Transsexuals



Vincent, Gaumond, Baillargeon, Marchand. Preliminary results (in preparation)



Several factors:

- development (childhood trauma)
- Biological factors (SH)
- Psycho-socio-cultural factors (gender expectation)

Brain Research 958 (2002) 139–145

BRAIN RESEARCH

www.elsevier.com/locate/brainres

Research report

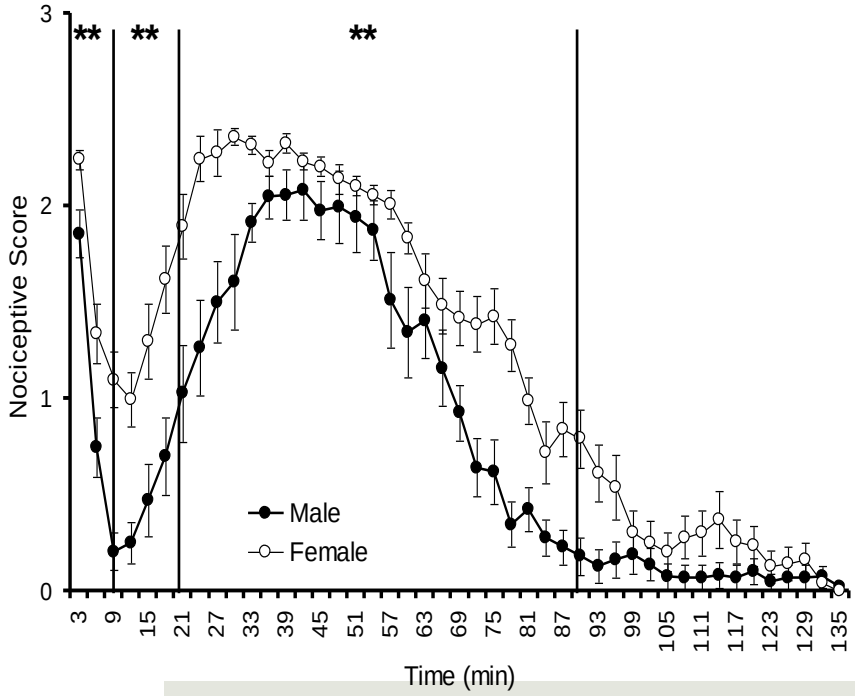
The role of sex hormones on formalin-induced nociceptive responses

Isabelle Gaumond[a], Pierre Arsenault[b], Serge Marchand[a,b,*]

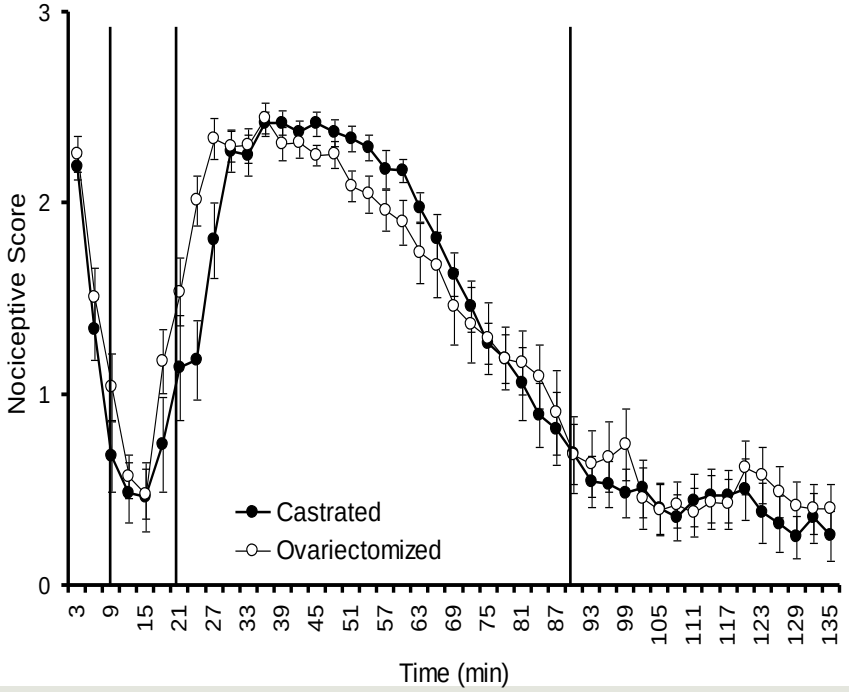
[a]Département des Sciences de la santé, Université du Québec en Abitibi-Témiscamingue, Rouyn-Noranda, Québec, Canada
[b]Chaire en douleur et réadaptation UQAT-UdeS, Université de Sherbrooke, Faculté de médecine, Sherbrooke, Québec, Canada

Accepted 11 September 2002

Female>Male



Female = Male



CellPress 2014

Neuron
NeuroView

A Tale of Two Sexes

Marian Joëls[1,*] and Carol Mason[2,*]
[1]Brain Center Rudolf Magnus, University Medical Center Utrecht, 3584 CG Utrecht, the Netherlands
[2]Deparments of Pathology and Cell Biology, and Neuroscience, Columbia University, New York, NY 10032, USA
*Correspondence: m.joels@umcutrecht.nl (M.J.), cam4@columbia.edu (C.M.)
http://dx.doi.org/10.1016/j.neuron.2014.05.021

This year marks the first time that the largest Neuroscience societies in the U.S. and Europe are led by females. Here we discuss the challenges that women face in moving through the ranks of academia and propose ways to increase women's representation in the field.

SfN honors women in neuroscience with the Celebration of Women in Neuroscience events each year at the SfN annual meeting.
At the **2017** Celebration of Women in Neuroscience Luncheon, Tuesday, November 14

Conclusion

- There are major gender differences in neurophysiological responses: Good science takes into account these differences !
- Gender differences in the prevalence and treatment of several health problems!
- The collaboration of women and men in science will lead to a complementary and more complete understanding of neuroscience!

Diversity-, Sex- and Gender-Based Analysis in Specific STEM Topics

Gender Summit 2017

Catherine Morency
Professeure titulaire / full professor
Titulaire de la Chaire Mobilité / Head of Mobilité Chair
Titulaire de la CRC sur la Mobilité des personnes / Head of CRC on Personal Mobility
Polytechnique Montréal / CIRRELT / CIRODD

Why is it crucial in transport-related analysis?

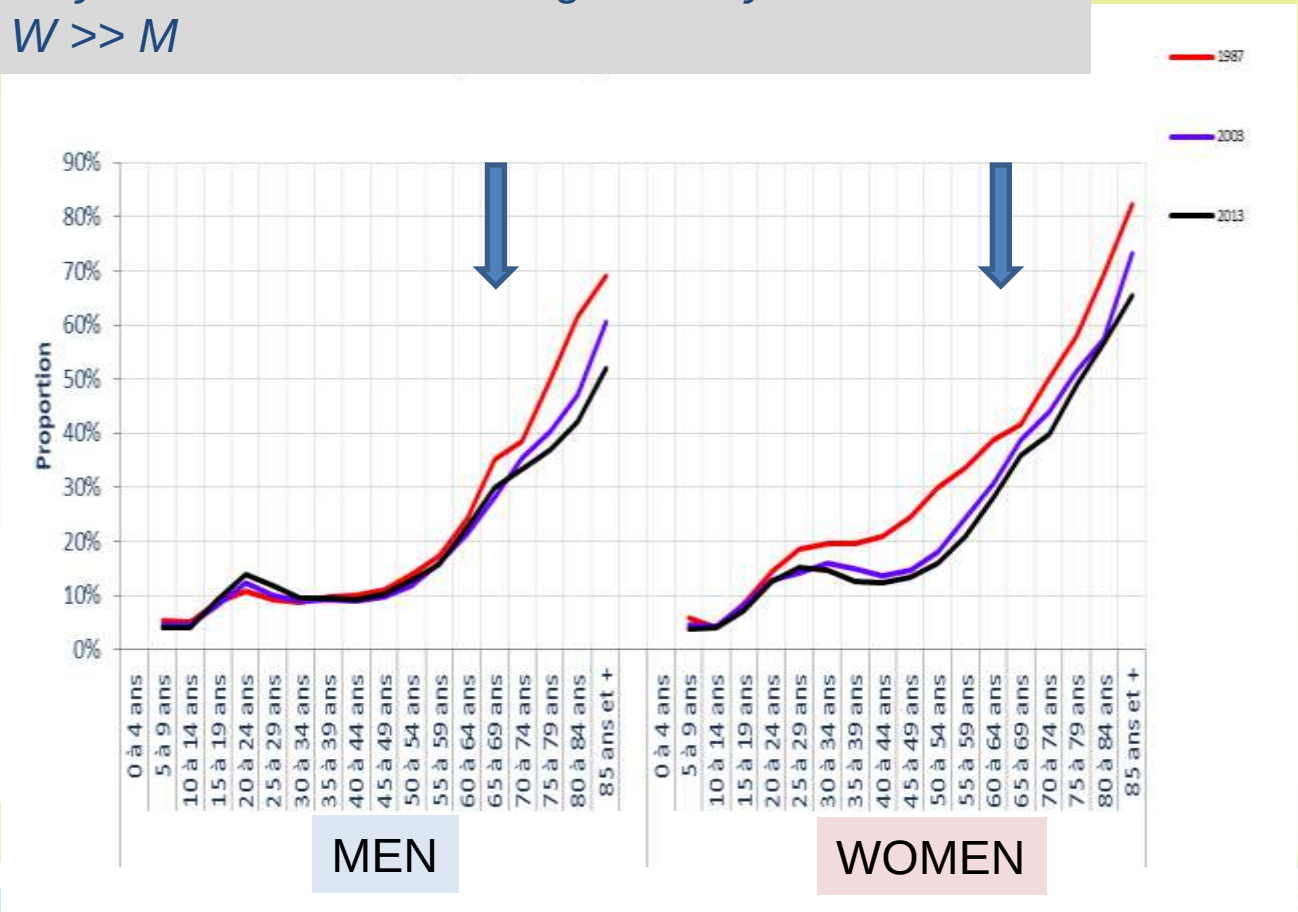
- Diversity of travel behaviours
  - Men vs Women w/r activity systems
  - Household type vs activity systems and interaction within households
  - Preferences & the perception of travel modes
- Key factors:
  - Workforce participation / type * location of jobs
  - Sharing of responsibilities within HH (drive someone, …)
- BUT: Men vs Women differences are getting smaller

Some examples

TRAVEL BEHAVIORS 1987 - 2013: MEN VS WOMEN?

Proportion of zero-trippers

All three surveys
25 y.o. +: behaviors are significantly different → W >> M

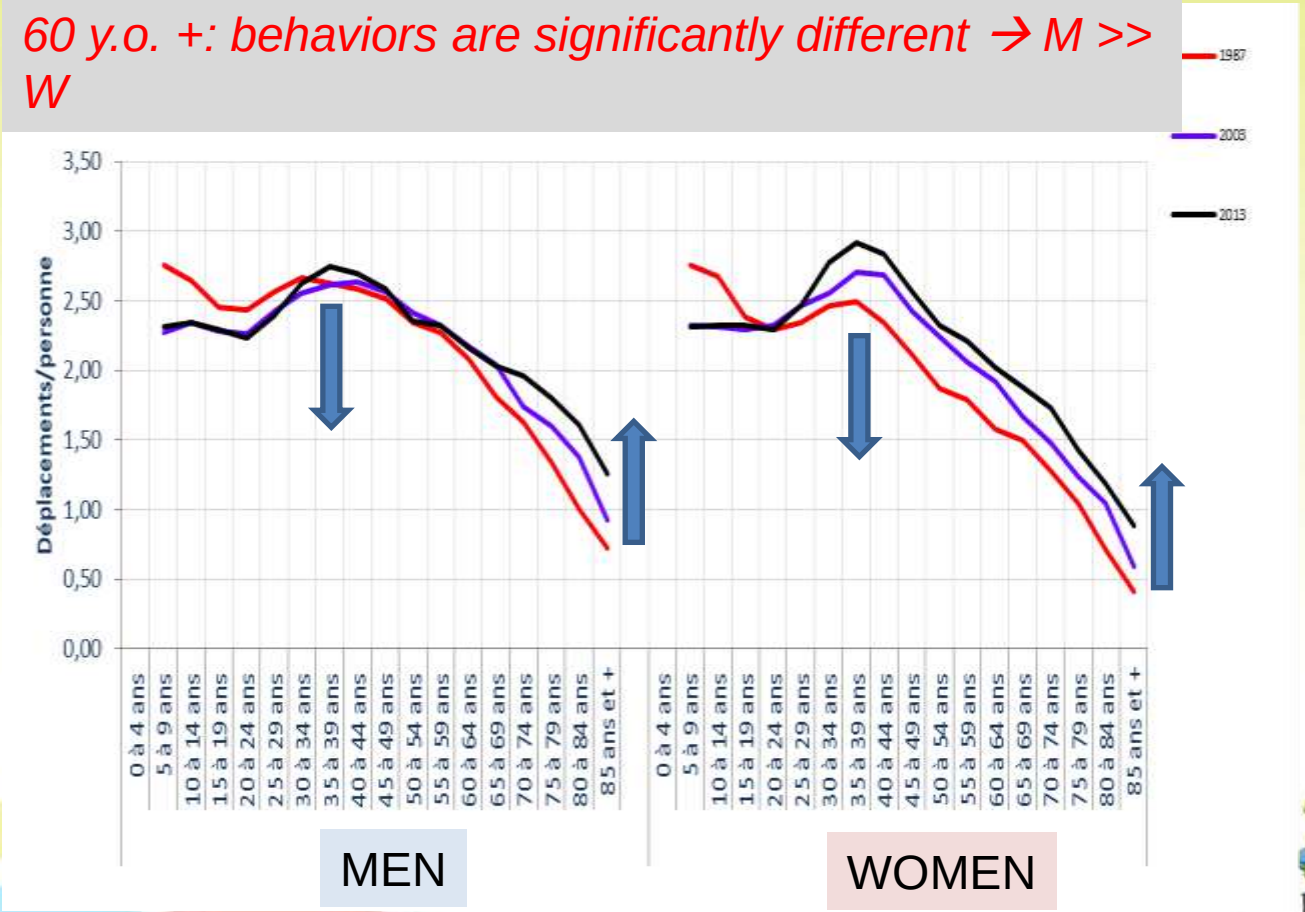


Mobility rates

2013:

30-44 y.o.: behaviors are significantly different → W >> M

60 y.o. +: behaviors are significantly different → M >> W



Trip chains

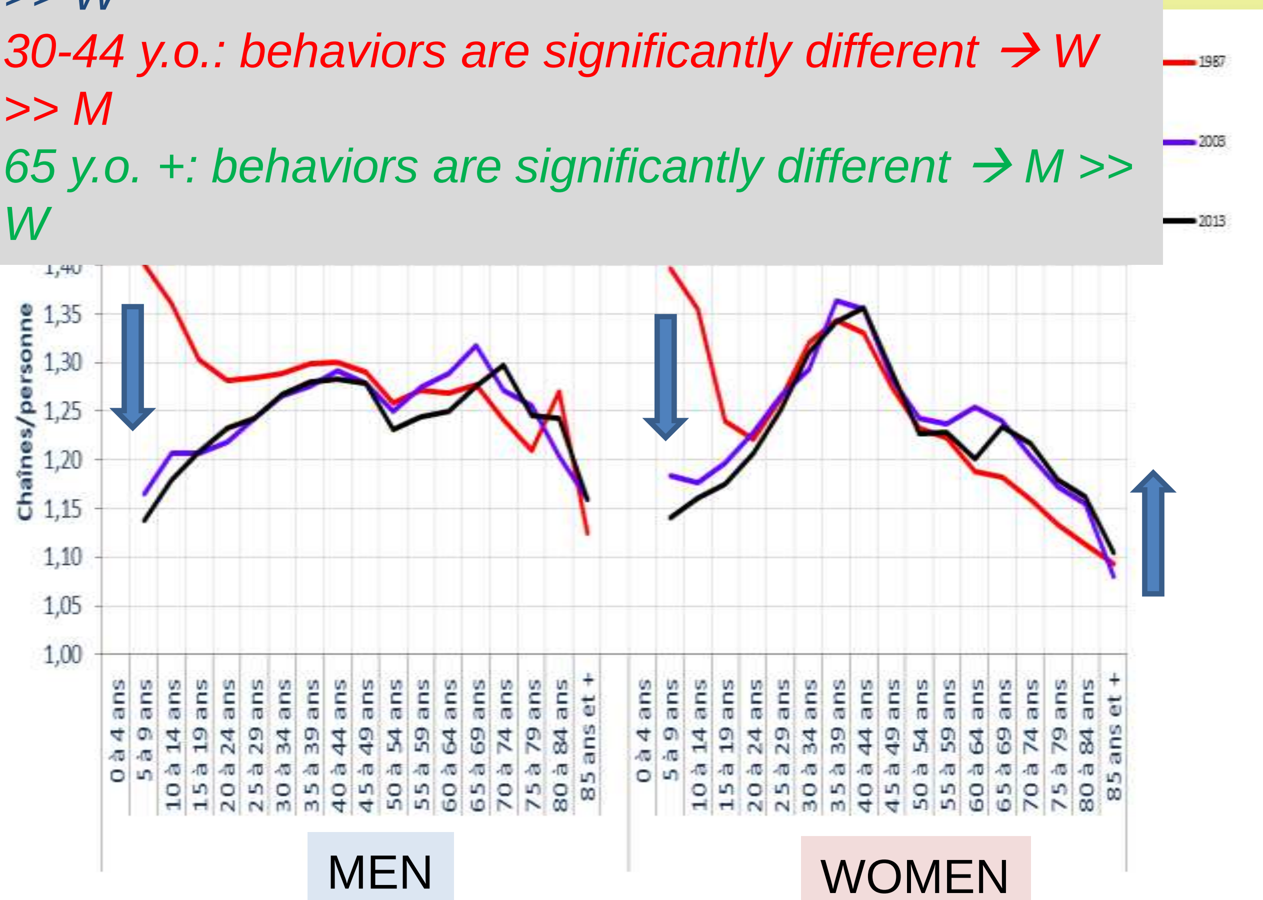
Sequence of trips starting and ending at the home location

2013:

15-19 y.o.: behaviors are significantly different → M >> W

30-44 y.o.: behaviors are significantly different → W >> M

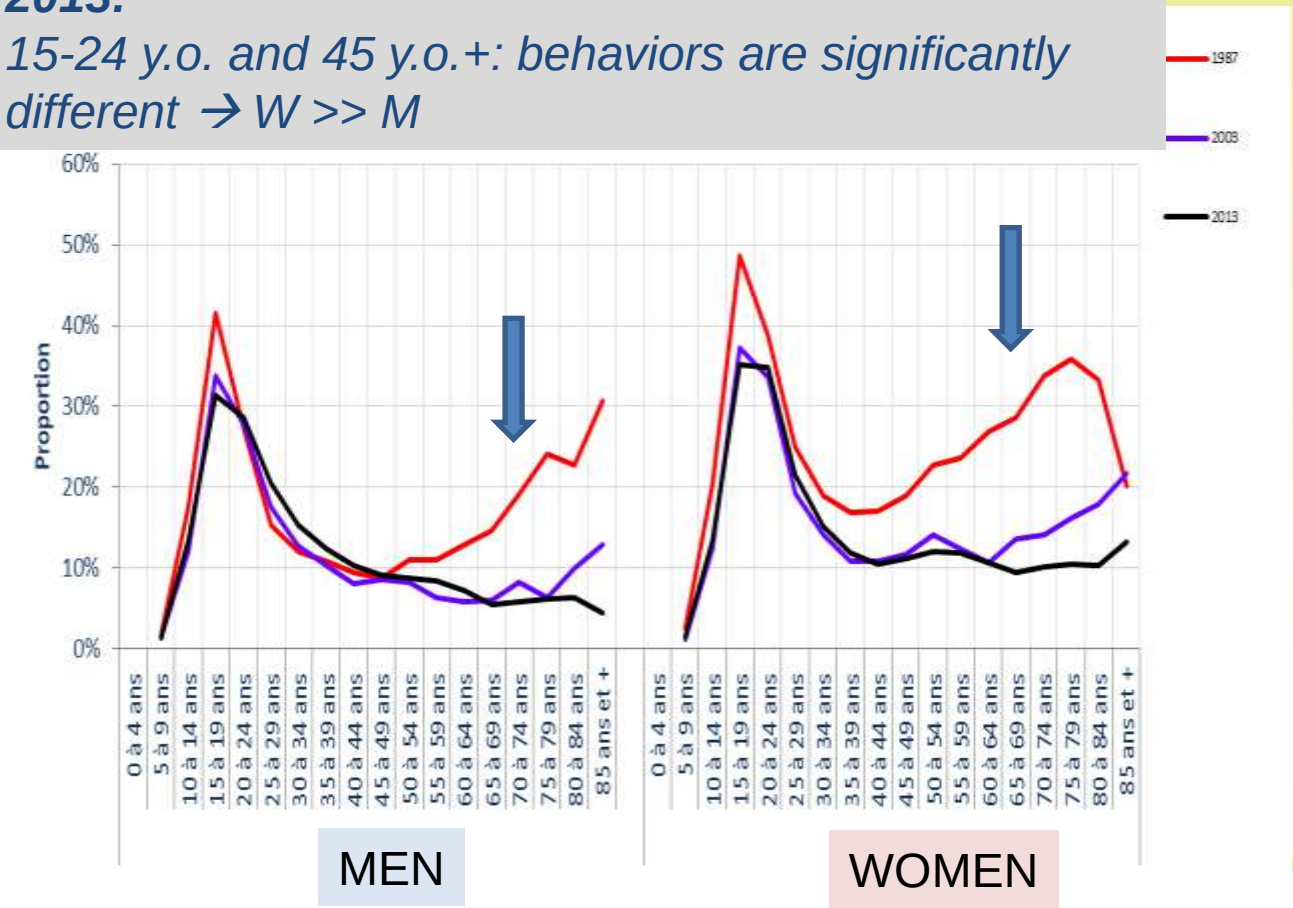
65 y.o. +: behaviors are significantly different → M >> W



Trip chains per day (only for people who do at least one trip)

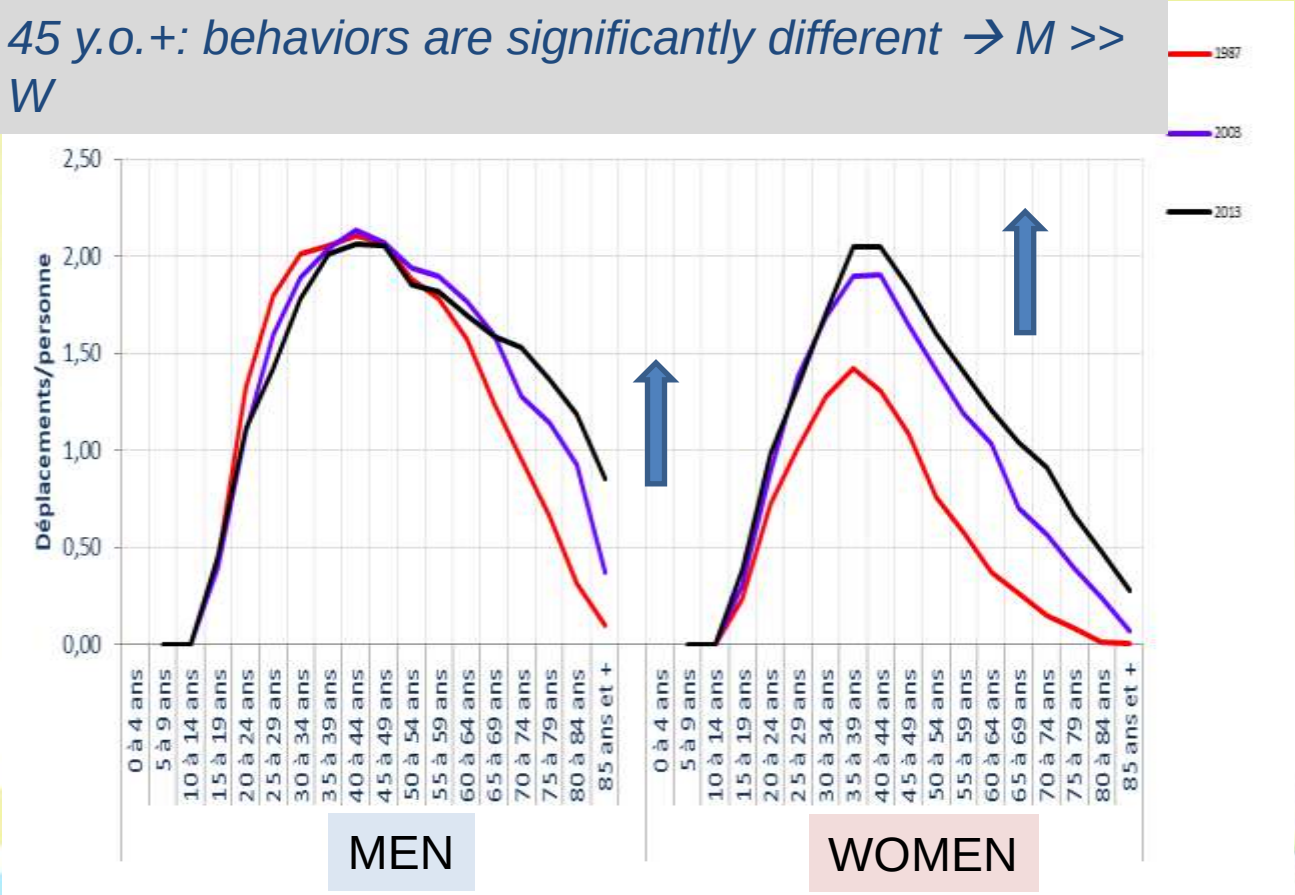
Transit share

2013:
15-24 y.o. and 45 y.o.+: behaviors are significantly different → W >> M



Car driver trips per day

2013:
45 y.o.+: behaviors are significantly different → M >> W



Why is it difficult?

- The challenge of data collection and operational data
  - Delicate questions to be asked (gender, ethnicity, income level)
  - Usually no demographic information linked to operational data
  - Sampling and survey methods may exclude specific population segments (limited access to technology, language barrier, privacy concerns, etc.)
  - Models not suited to account for diversity of preferences (elderly who walk shorter distances, men who prefer cycling, etc.)

d… behavi… d… access

Men have higher access than women to combined options

Difference between number and Intensity confirms the interest of dynamic indicators

PEOPLE			Comp…			
Group 1	Group 2	Tran…rtati on opt…ns index	K-S	G1	G2	Differenc e (G1 - G2)
Men	Women	Number	>	0.137	0.138	-0.001
		Intensity	>	0.243	0.239	0.004
Less than 18 years old	18 years and older	Number	<	0.144	0.136	0.008
		Intensity	<	0.239	0.241	-0.002
Teenagers 12 to 15 years old	Other people	Number	<	0.141	0.137	0.004
		Intensity	<	0.241	0.241	0.000
Seniors of 65 years and older	Other people	Number	<	0.138	0.137	0.001
		Intensity	<	0.235	0.242	-0.007
Driving license	No driving license	Number	<	0.137	0.138	-0.001
		Intensity	<	0.246	0.224	0.022