



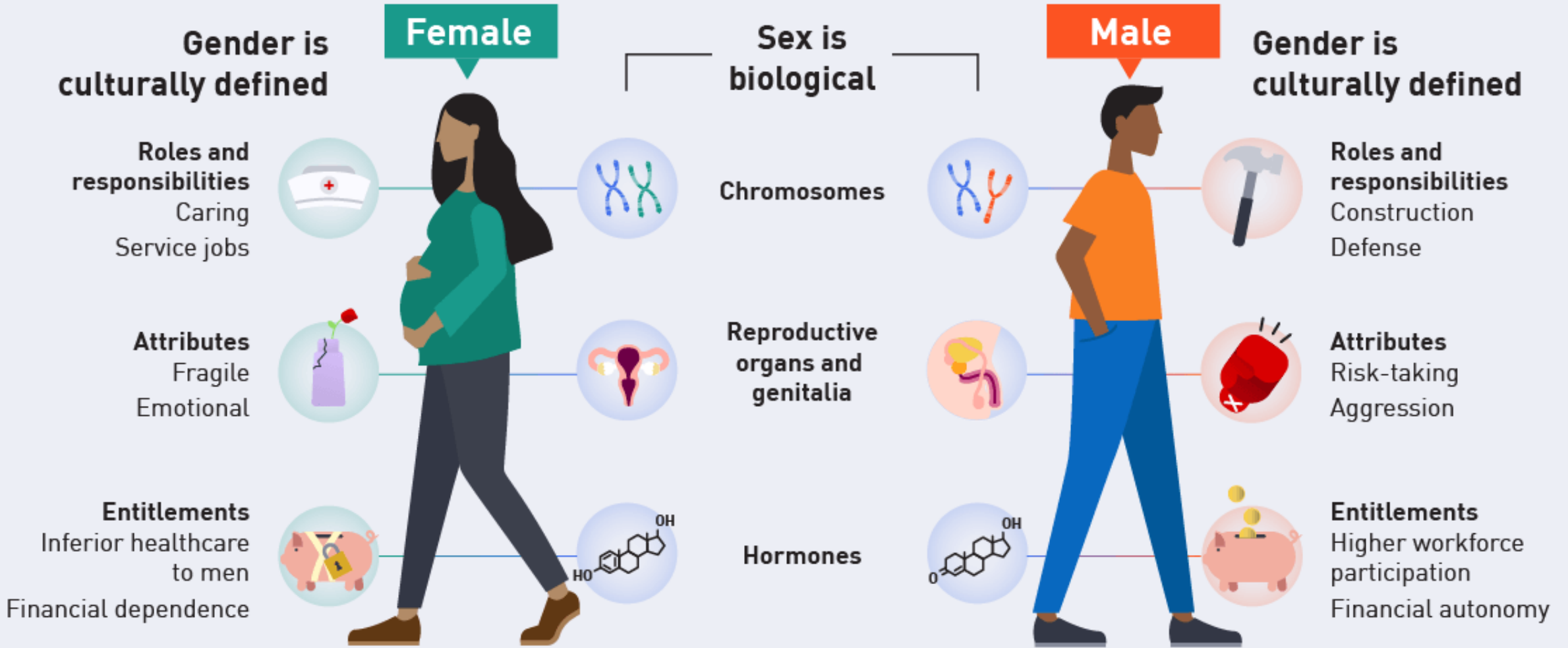
The gender gap in personal protective equipment

Anya Keefe, MSc.

2024 Mining Health & Safety Conference
Inclusive mines, a safer future

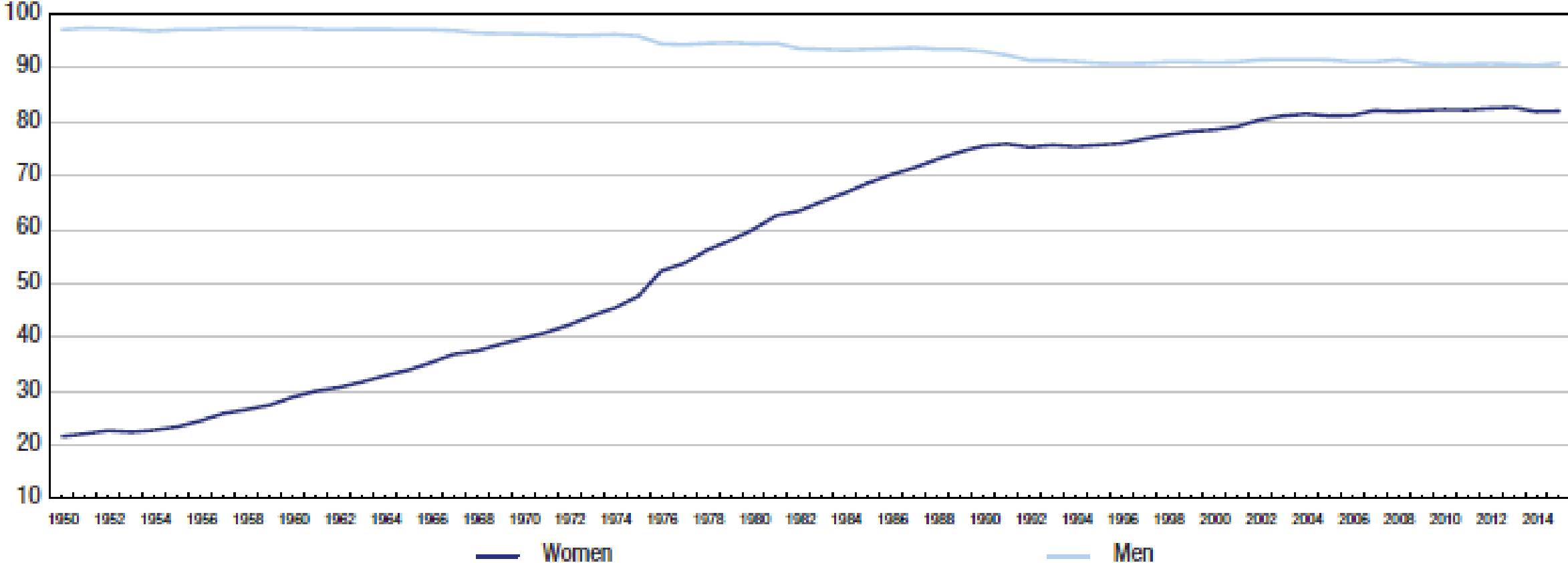
April 18, 2024

Sex vs Gender



Steady increase in women's participation in labour force

Labour Force Participation by Sex (1950-2015)

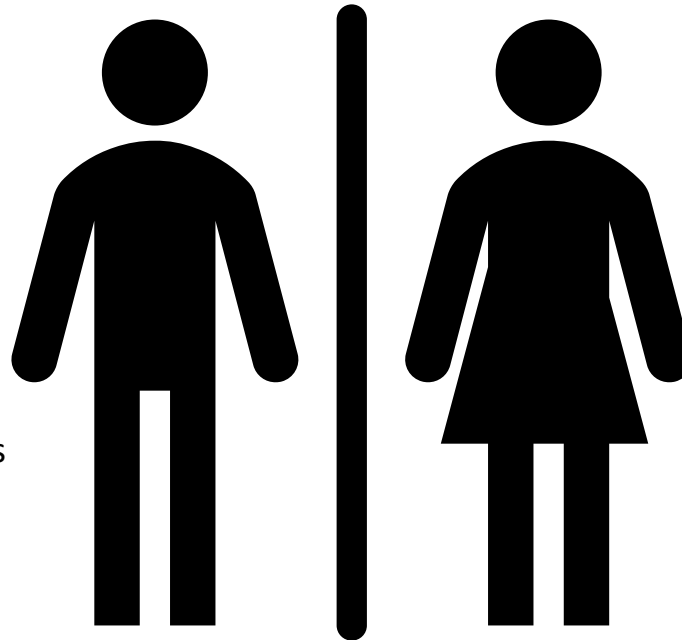


Note: Data covering the period of 1950 to 1965 exclude Newfoundland and Labrador.
Source: Statistics Canada, Labour Force Survey, CANSIM table 282-0002 and custom tabulations.

Work is highly segregated by sex and gender

Top 10 Occupations in Canada Dominated by Men

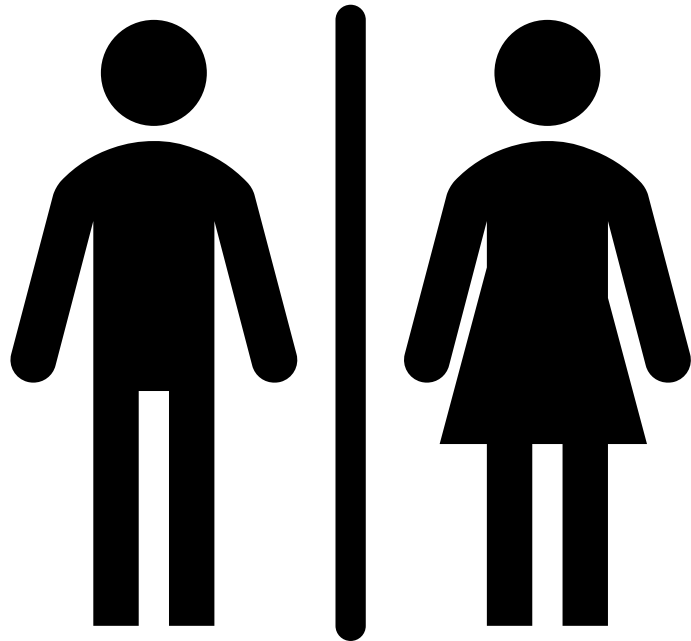
Motorcycle, all-terrain vehicle, and other related mechanics
Bricklayers
Heavy-duty equipment mechanics
Drillers and Blasters – surface mining, quarrying, and construction
Elevator constructors and mechanics
Steamfitters, pipefitters, and sprinkler system installers
Heating, refrigeration, and air-conditioning mechanics
Plumbers
Construction millwrights and industrial mechanics
Railway carmen/women



Top 10 Occupations in Canada Dominated by Women

Medical administrative assistants
Dental assistants
Dental hygienists and dental therapists
Early childhood educators and assistants
Dietitians and nutritionists
Home child care providers
Court reporters, medical transcriptionists, and related occupations
Receptionists
Registered nurses and registered psychiatric nurses
Administrative assistants

Segregation of labour has OHS impacts



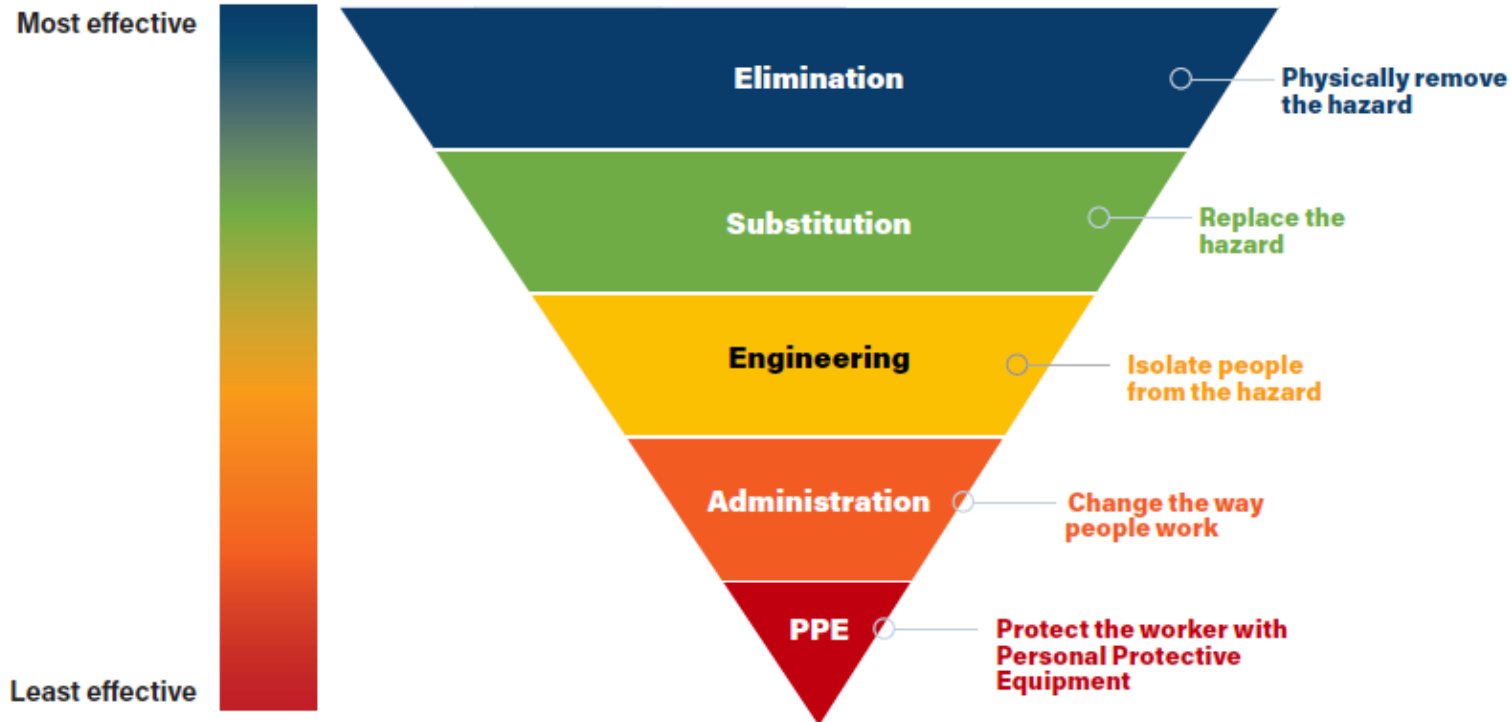
- Biological attributes influence:
 - how chemicals are absorbed, distributed, stored, and metabolized in the body
 - biologically active dose and the type of effects experienced following exposure
- This means that men and women:
 - respond differently to chemical, physical, and biological exposures
 - can be differentially affected by the same level of exposure to chemical or biological agents
 - have different rates of occupational injuries and diseases

Lung cancer risks, by sex and gender

Occupation (Division Level)	Males		Females	
	Cases (Workers)	HR (95% CI)	Cases (Workers)	HR (95% CI)
Teaching and related	89 (11781)	0.39 (0.31-0.47)	336 (49682)	0.53 (0.48-0.59)
Medicine and health	212 (19801)	0.74 (0.64-0.84)	1623 (136690)	0.83 (0.79-0.88)
Clerical and related	1683 (102699)	1.00 (0.95-1.05)	1786 (110145)	1.10 (1.04-1.15)
Service	3341 (204124)	0.93 (0.89-0.96)	3178 (205954)	1.12 (1.08-1.17)
Mining and quarrying	489 (13339)	1.36 (1.25-1.49)	6 (197)	3.05 (1.37-6.78)
Construction trades	4759 (227872)	1.11 (1.07-1.14)	74 (6013)	1.40 (1.11-1.76)
Transport equipment operating	4158 (166625)	1.37 (1.33-1.42)	288 (16922)	1.55 (1.38-1.74)
Other crafts and equipment operating	496 (22370)	1.02 (0.93-1.12)	189 (7005)	1.50 (1.30-1.73)

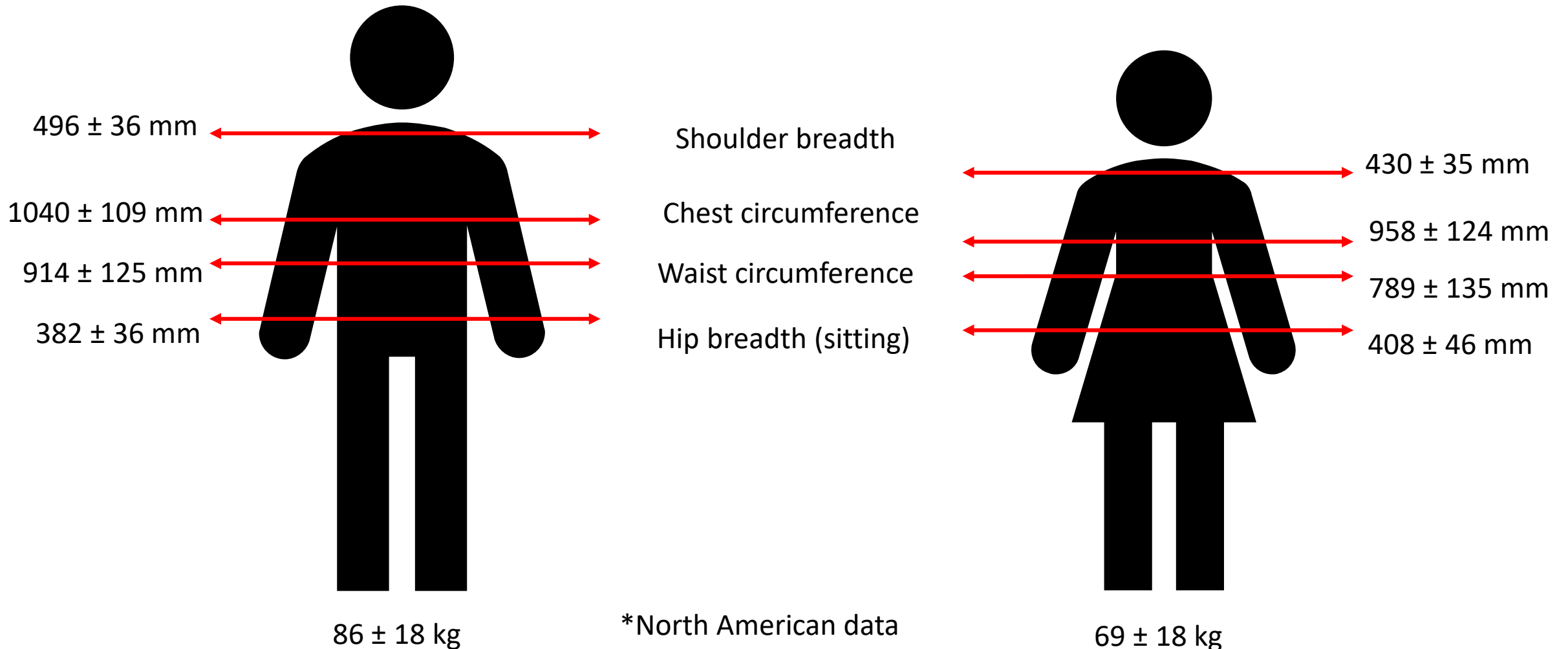
Source: Occupational Cancer Research Centre (<https://www.occupationalcancer.ca/>)

PPE ... the last line of defence



- Often seen as simple and inexpensive way to control exposure
- Certain types must be worn continually
- Poorly designed and poorly fitting PPE can contribute to workers being injured in the workplace

How are males and females different?



Implications for the design of neck-down coverall



- Little overlap between male and female anatomical proportions for measurements relevant to coverall design
- Coveralls and other protective clothing designed on men's proportions cannot be linearly scaled down to fit women
- Male-proportioned protective clothing scaled down to fit a woman's stature, shoulder breadth, or upper chest circumference will be too tight in the hips

In other words, **women are not scaled down men!**

What does the literature tell us about PPE design?

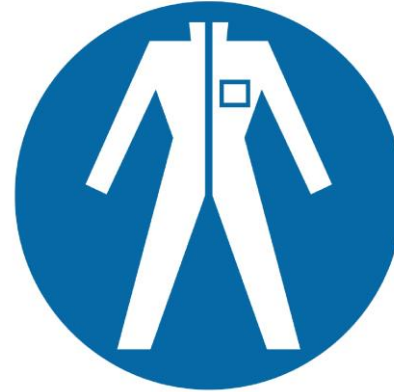


Critical Design Parameters:

Fit & comfort

Key Research Findings:

Significant differences in facial anthropometric dimensions by gender



Functional fit, freedom of movement

Across a range of body dimensions, females were smaller than males and had a lower waist-to-hip ratio



Fit & comfort

Approximately 25% of men and 30% of women would not be able to find a well-fitting harness



SAFETY GLASSES



SAFETY GLASSES



WEAR DUST



VAPOR RESPIRATOR



RESPIRATORY MASK



BREATHING APPARATUS SET



WELDING MASK



WELDING MASK



SAFETY HELMET



SAFETY HELMET WITH FLASHLIGHT



EAR PROTECTION



HAIR PROTECTION



CHEMICAL GLOVES



SAFETY GLOVES



ANTI STATIC GLOVES



SAFETY BOOT



CHEMICAL BOOT



ANTI STATIC SHOES



HIGH VIS CLOTHING



PROTECTIVE CLOTHING



SAFETY HARNESS



APRON



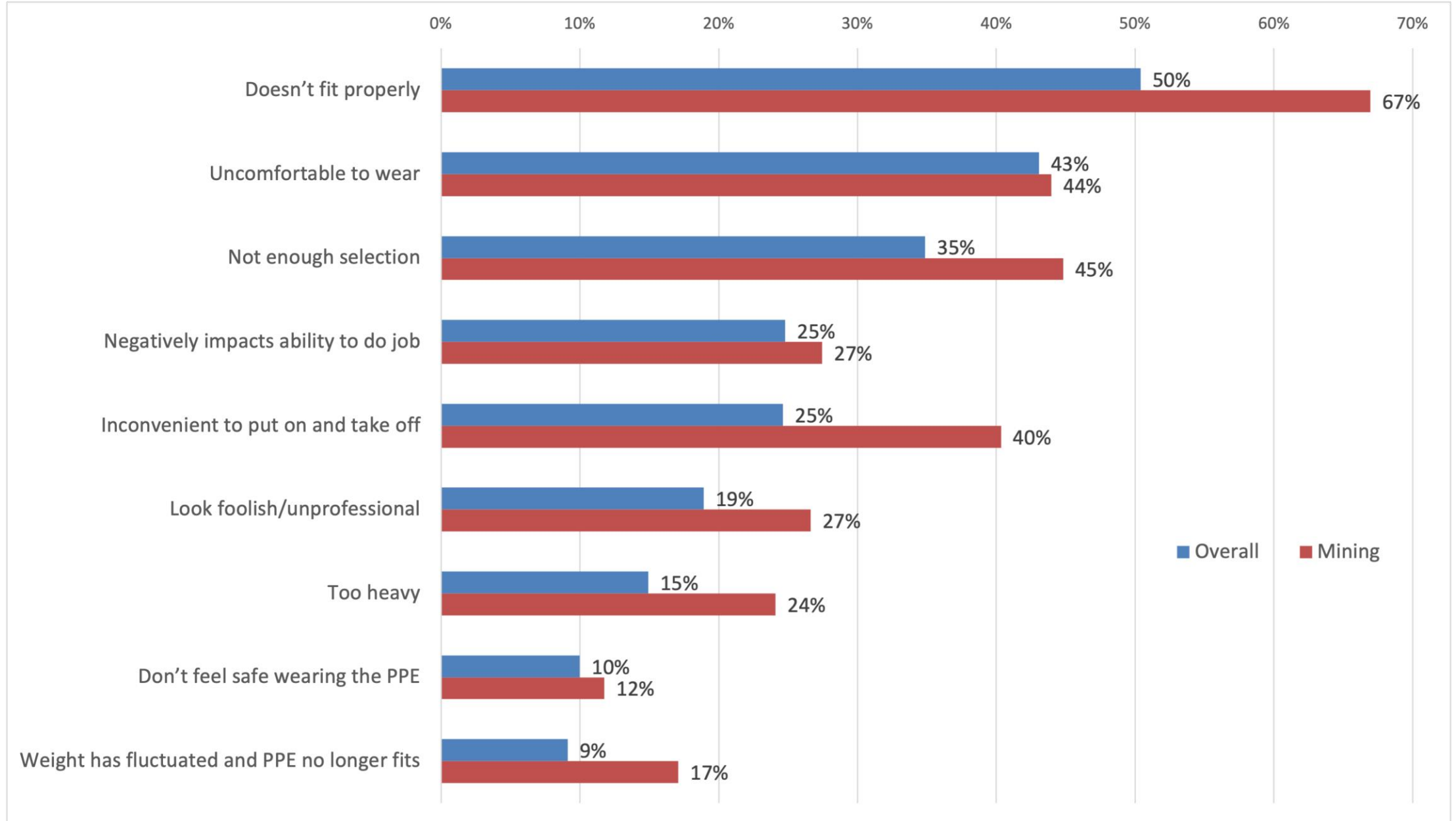
LABORATORY COAT



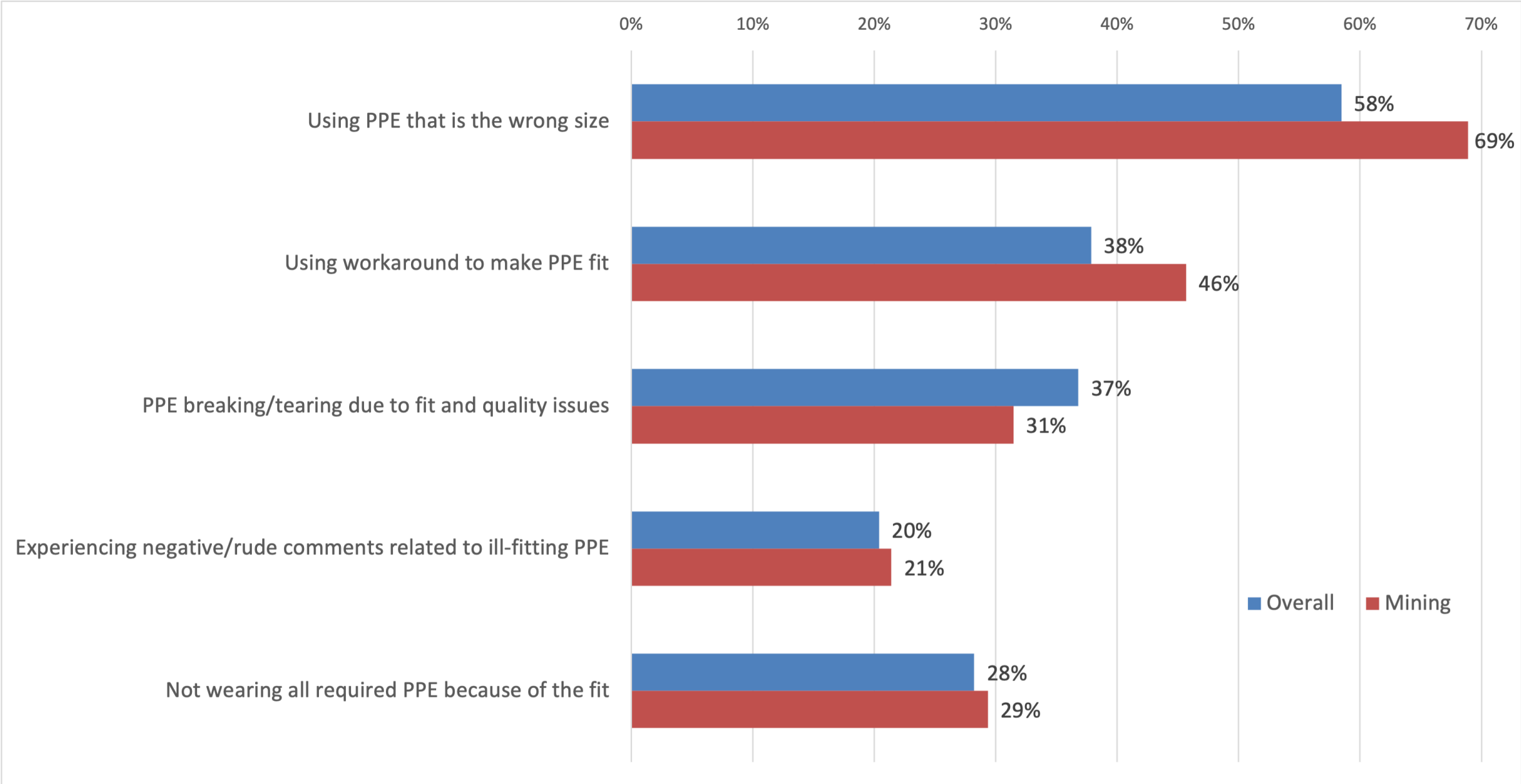
LIFE JACKET

- Women want PPE that fits, is comfortable to wear and keeps them safe
- Women experience a range of problems with their PPE
- Women respond to these problems by
 - paying out of pocket for some or all of their PPE
 - modifying or altering their PPE

Top issues that women have with their PPE



Routine experiences women have with their PPE...



What women in mining say about their experience with PPE...

I've had to **pull up the coveralls** so that the crotch wasn't at my knees and **tape them around the waist** so I don't trip on the crotch walking up stairs and climbing ladders. I've had to **tape the wrists** as well to prevent the sleeves from hanging over my hands. I **usually just bring my own** coveralls which over the years has **cost me literally thousands of dollars** as my coveralls are required to be FR material.

Coveralls are way too baggy which **puts me at risk of getting them caught in moving parts and machinery**, this is the same for high vis vests. Hard hats are way too big and **don't adjust small enough to fit properly**, therefore they do not provide safety protection whatsoever in the event something were to fall on my head, they also **pose a visual hazard** as they tip down into my line of sight and the weight of them is very hard on my neck causing pain. I have to buy the Dakota mens size 7 which are two sizes too big for me, this is **unsafe for proper ergonomics of walking**, it also does not provide proper arch or foot support with them being so big! Respirators! I have **never been able to pass a fit test** with any that have been provided. They practically cover my whole face. This **limits my ability to advance or excel** in a lot of positions!

Trying to **shrink fall arrest harness** enough that I won't fall out of it

Women in mining perceive their PPE has contributed to injury or illness

Mostly **being caught** on loose PPE, limited range of motion causing **trips**, leaking waterproof gear causing **chemical burns**, gloves failing during a job, safety glasses that are unusable due to **chafing** and fogging.

I **don't use the bathroom in the winter** because it's too hard, **blisters** from ill fitting PPE rubbing, clothing **catching on equipment and falling**, **cutting myself** when a glove slid off.

I've had an FR winter parka that was way too heavy to wear. It gave me **back and shoulder pain** when trying to perform normal job duties.

I have been **burned hundreds of times** by having sleeves and pant legs that are not long enough to provide coverage when I'm in awkward positions. I literally have become an expert at being burned and maintaining my welding arc because it happens so often. My **boobs are covered in tiny scars**.

Working women want more PPE like this...

FEATURES CALL-OUTS

1. Ergonomic yoke;
2. Front hip-bend shaped patterning;
3. 10x10" Below pocket, drain eyelets;
4. FR reflective strips;
5. Belt Tunnel with elastic at CB;
6. Hook and loop front closure;
7. One piece crotch gusset;
8. Pocket puller loop;
9. Shaped pattern at knee bend;
10. Protective knee padding;
11. Reinforced ankle hem;
12. Inner elasticated ankle cuff in lining;
13. Separable lining per standards.

USER TESTING

DONNING TEST

Current gear	Prototype
 15 SEC	 12 SEC

OVERALL TASKS RATING

Task	Rating
Protection	4
Comfort	4
Secured in place	4

Participants' Likert scale rating: (1) Strongly disagree, (6) Strongly agree

*pant colour not for reference

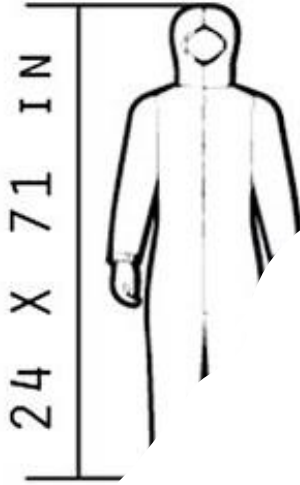





SAFEMAX
PROTECTIVE CLOTHING

PINK

S - M - L



and less like this...

“Some women are fine with pink PPE, but for some of us it just adds to the difficulty in being taken seriously in the workplace.”

British Columbia, Natural Resources

What's Needed to Address the Gender Gap in PPE?

At a System Level

- National sizing survey + workforce specific anthropometric database
- Gender-inclusive design
 - “Don't just shrink it and pink it”
- Improved regulatory framework
- Mainstreaming of gender and equity into OHS

At the Workplace Level

- Recognition that **this is an EDI issue**
 - Gender-neutral/one-size-fits-all is not equally protective
- Application of a sex and gender lens to procurement
- Individualized, consultative approaches and flexible policies
- Education and awareness

The Last Word...

I have **yet to find a respirator that remains well fitting while actually working** (pit geological duties at coal mine). Vest, coveralls, gloves etc always have **excess material that constitutes a hazard near moving equipment and makes movement inefficient and tiring when walking** in the pit and on dumps/stockpiles. Workboots that are tough enough for the conditions are not made in women's sizes and I have to add extra socks and insoles to **compensate for unnecessary width** and still have **problems with comfort**.

Women's specific shape/sizing - **shrinking men's clothing/PPE and calling it "unisex" is not adequate**. My "unisex" fire-resistant clothing is constantly too long in the crotch, too large in the shoulders, and too small in the hips; the ill-fitting clothing causes chafing, hinders my movement, and makes me look unprofessional. Head protection, eye protection, gloves, safety boots, etc. are often **not available in sizes appropriate for my body** (or have very **limited availability** and are difficult to get in remote locations, or are **more costly**).



STANDARDS RESEARCH

Canadian Women's Experiences with Personal Protective Equipment in the Workplace

November 2022

Thank you!

CSA Research Report available at:

<https://www.csagroup.org/article/research/canadian-womens-experiences-with-personal-protective-equipment-in-the-workplace/>

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