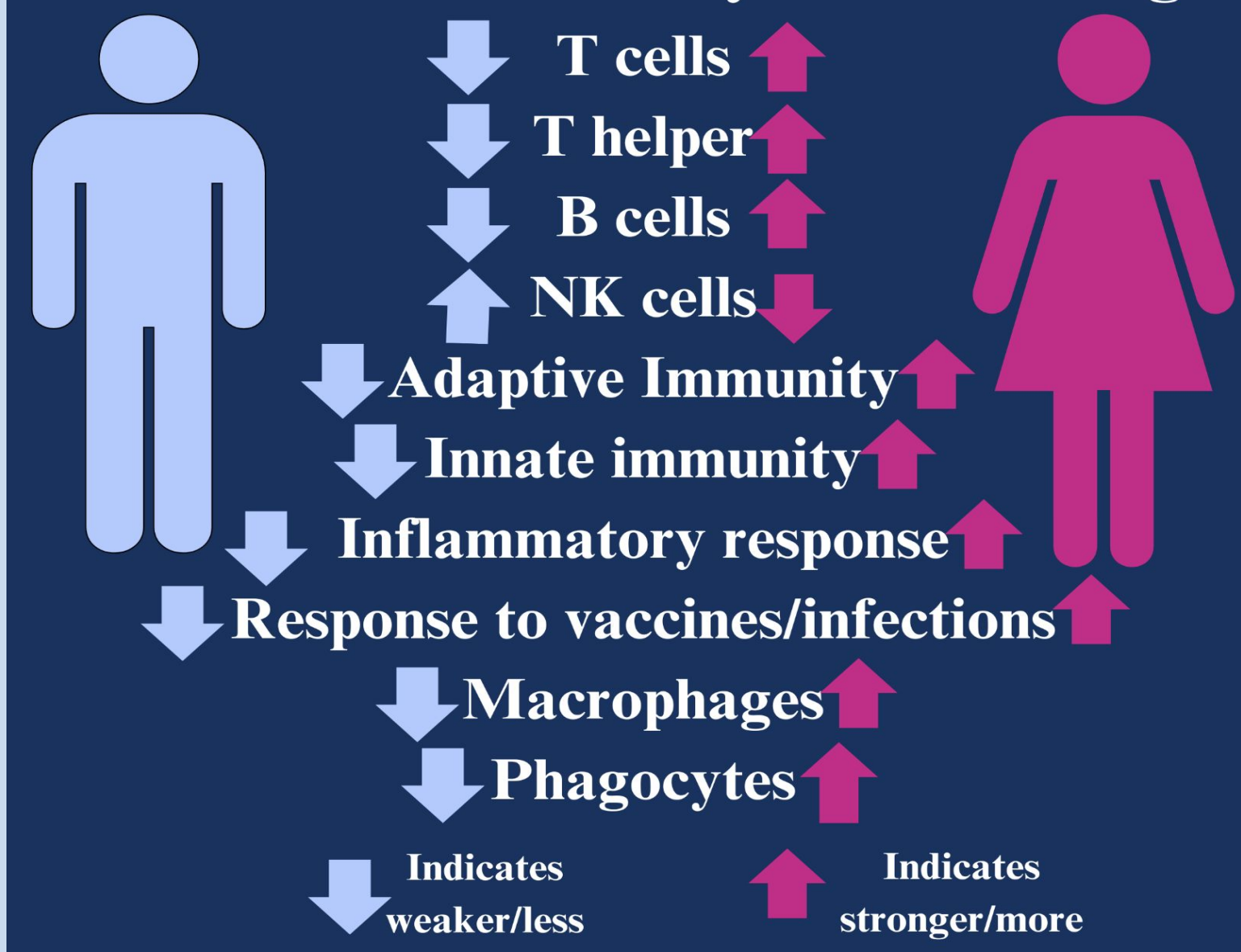


The Effects of Covid-19 are Sex-Dependent

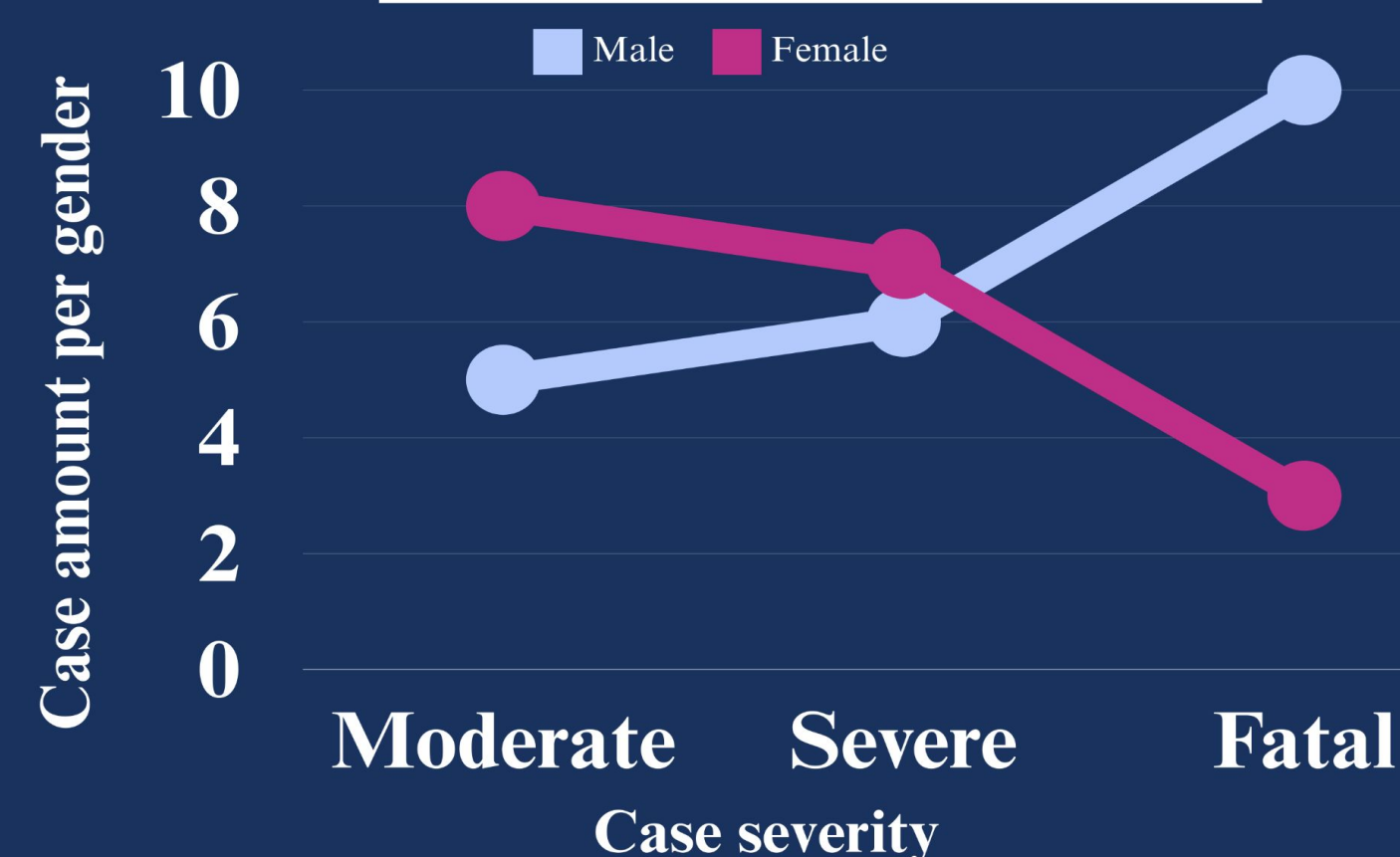
Abstract:

- Covid mortality is twice as high in men.
- Sex-related immune system differences are responsible for the different levels of susceptibility and mortality of Covid-19 in men and women.
- Twice as many men are sampled in Covid research, causing women to be underrepresented. This may lead to ineffective treatments or vaccines.

The Female Immune System is Stronger



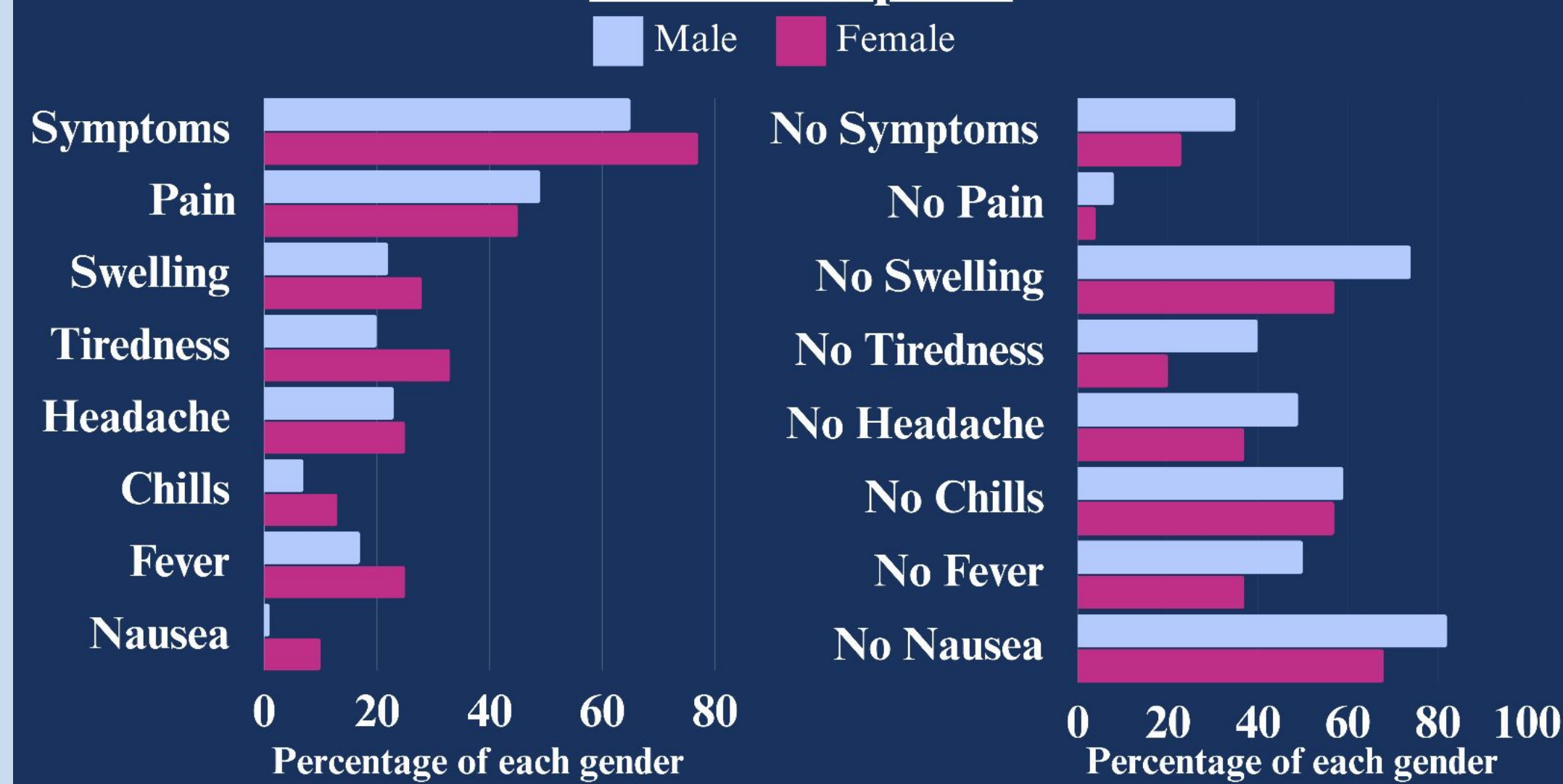
Covid is less fatal in women



Results:

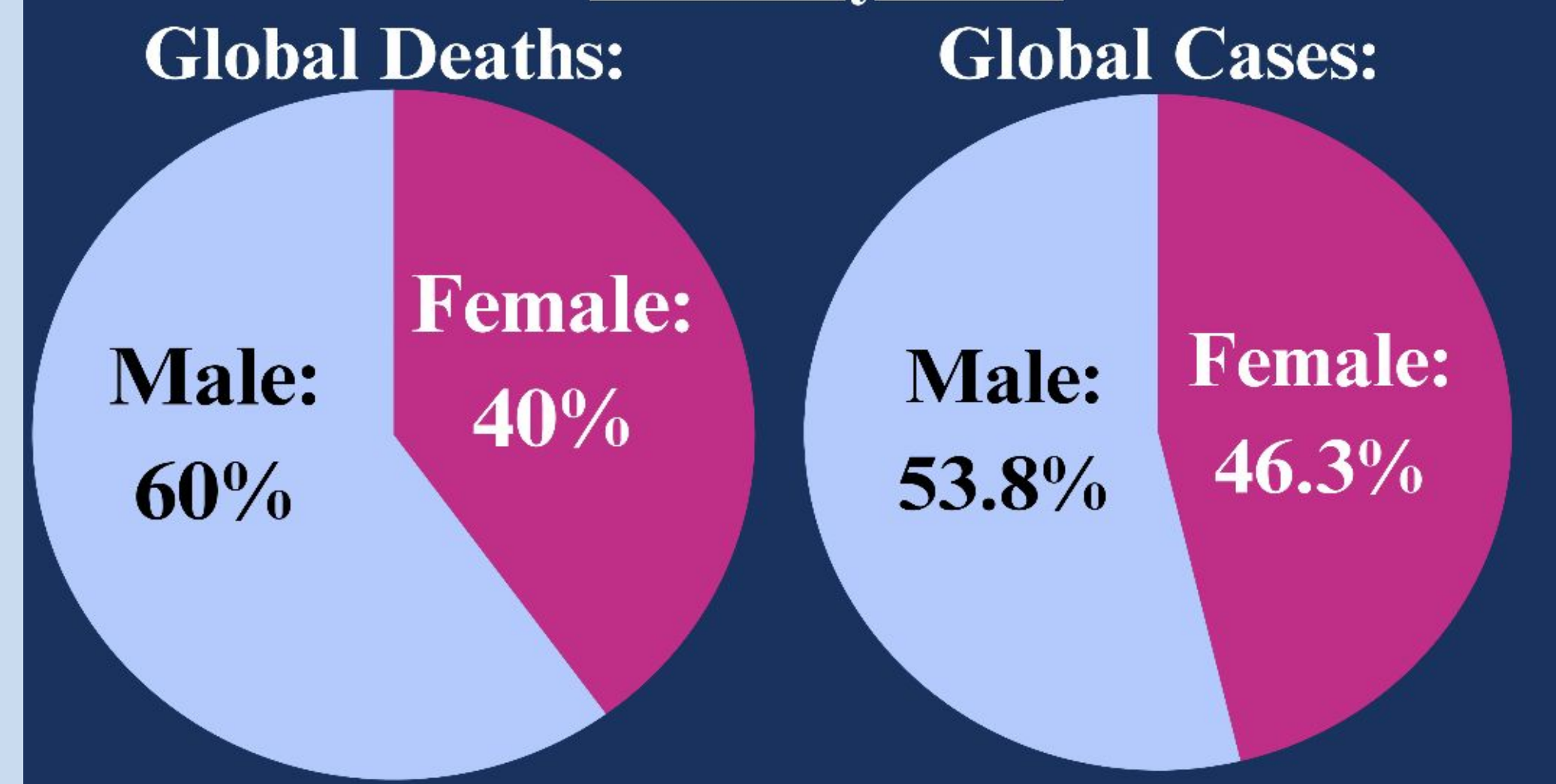
- Women have a stronger antibody response to viral infections, lowering mortality.
- Men are more susceptible to Covid because they lack an additional X chromosome and have testosterone.
- Women produce a stronger response to Covid vaccines and produce more antibodies.

Females have more vaccine symptoms caused by a stronger immune response



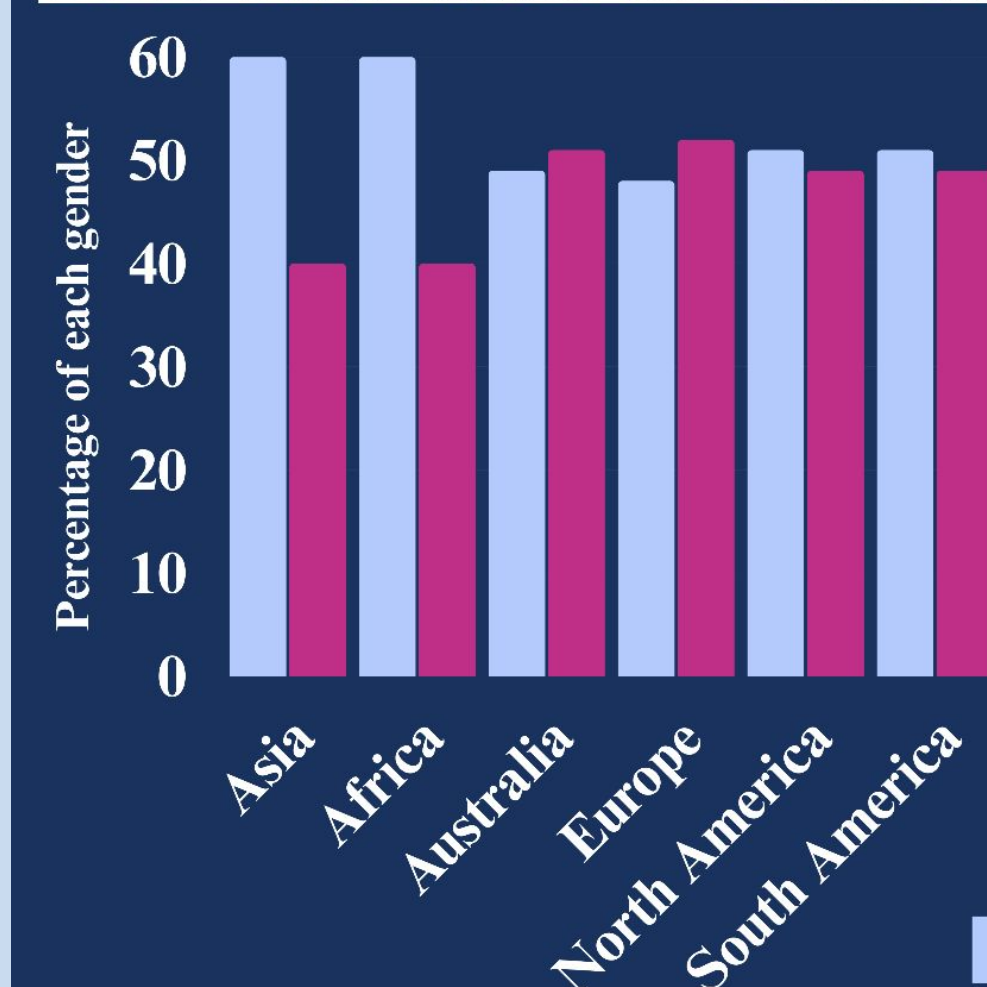
Over 79% of Covid vaccine side effects are from women.

Men have increased Covid-19 susceptibility and mortality rates

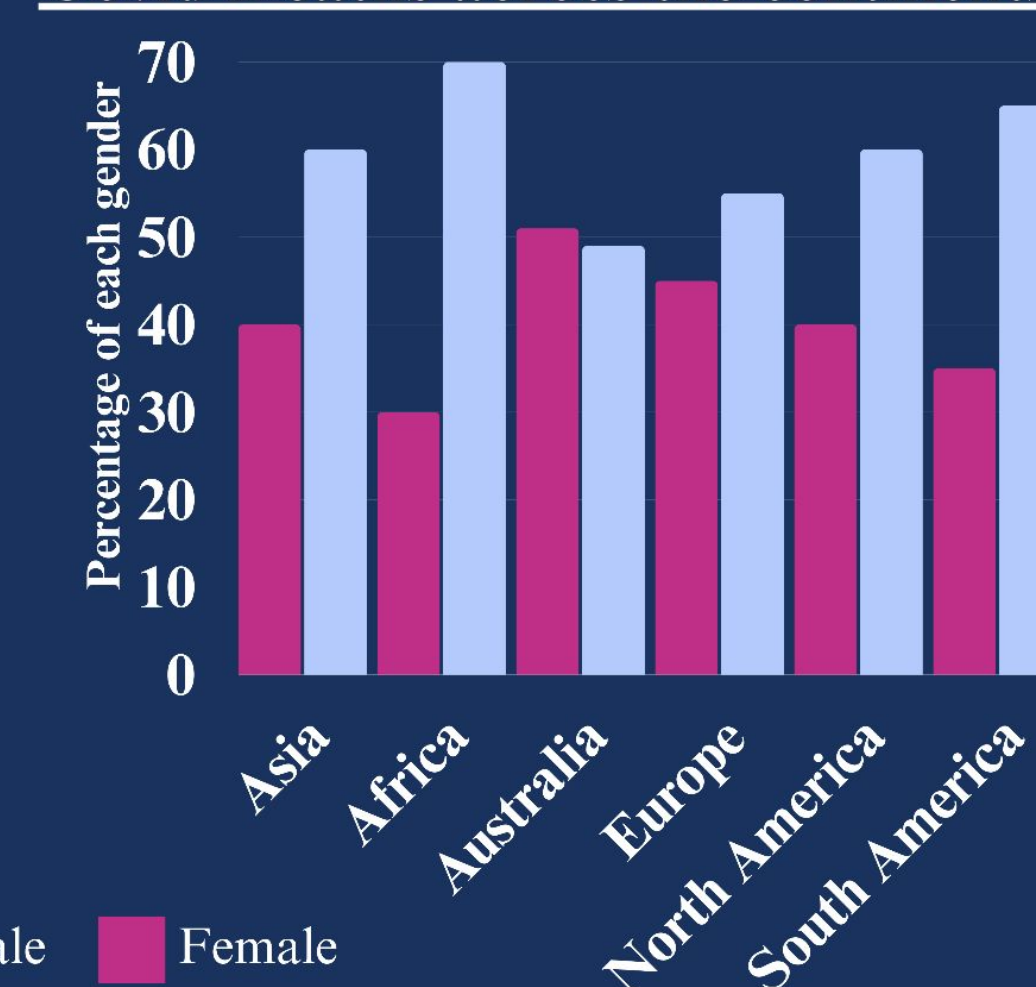


Male patients are 30% more likely to die due to Covid-19.

Covid Cases across the continents:



Covid Deaths across the continents:



Females have a lower Covid-19 mortality/susceptibility rate.

Statistical Question: How do Sex-Based Immune System Differences Determine the Effects of Covid-19?

Why is the female immune system stronger?

Women have a higher expression of immune-related genes because the X chromosome has 10x more genes than the Y chromosome.

Antibodies	Women produce antibodies during earlier phases of Covid, rapid pathogen reduction
MicroRNAs	X-chromosome gene, increased post-vaccine antibody production, stronger innate/adaptive immunity
Toll-Like Receptor 7	X-chromosome gene, aids in virus detection
Estrogen	immune activator, circulates/increases antibodies, increases adaptive immunity
Testosterone	immune suppressor
Cytokines	increased reaction and production in men leading to severe Covid because of pro-inflammation
Toll-Like Receptor 4	greater expression in the male immune cells, promotes pro-inflammatory cytokines
T cells (CD4+T)	more active in females, reduces severity of diseases, destroy pathogens

Conclusion

The female immune system is stronger because of increased immune cells, antibodies and estrogen.

- One Covid study shows that men made up 86% of the sample size, deeming women underrepresented. Vaccines may be too strong for women, triggering adverse side effects or less effective for men leading to a greater severity/mortality rate.
- Through equal data samples we can mitigate vaccine side effects for females and increase male antibody/T cell production.
- This will reduce the male mortality/severity rate of Covid-19.