

# **SEX AND GENDER INFLUENCES IN HEALTH AND DISEASE**

# Understanding Sex and Gender Influences in Health and Disease

Understanding sex and gender is critical to understanding health and to diagnosing and treating disease and illness. Disparities in the prevalence and severity of several conditions point to the need for further research in this area. For example:

Women are nearly twice as likely as men to be diagnosed with depression. <sup>[1]</sup>

Women and men have heart attacks at similar rates, but women are *more* likely to die as a result. <sup>[2]</sup>

Women make up about 78% of patients with autoimmune diseases. <sup>[3]</sup>

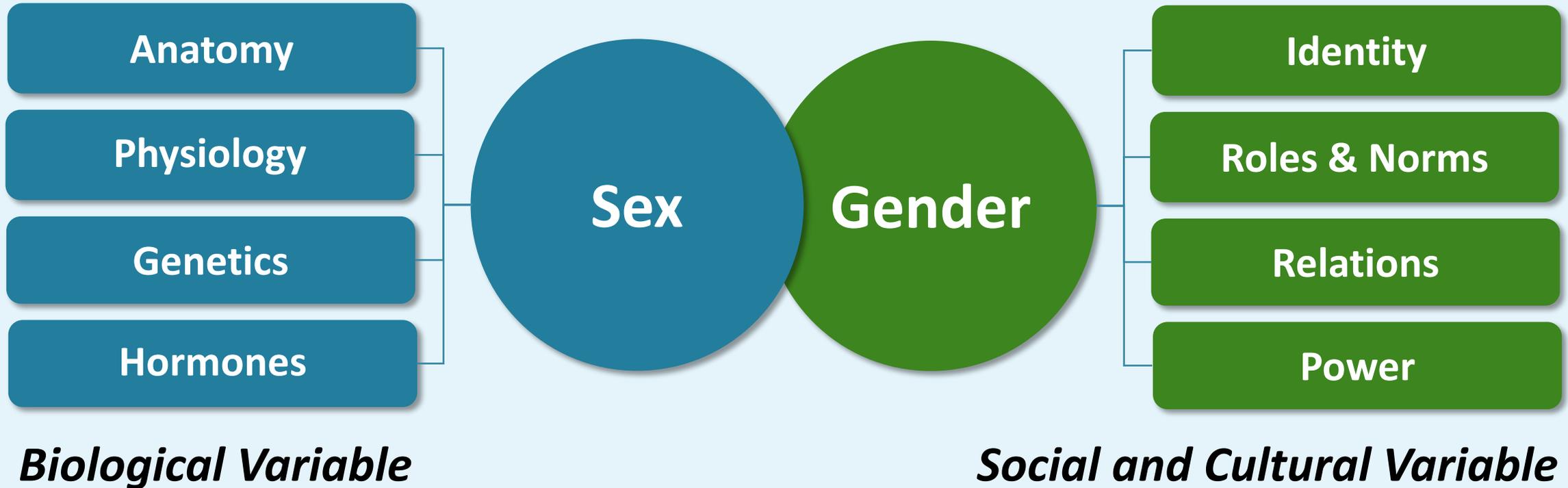
Women are more likely to have chronic pain than men, but women are less likely to receive treatment. <sup>[4]</sup>

To better understand and address these gaps, it is important to consider how both sex and gender influence these disparities. It is also important to understand that **sex** and **gender** are interconnected but distinct concepts, and that each affect health as both independent and interactive factors. The below graphic presents a few examples of sex and gender influences across various areas of health and disease to illustrate the distinction between sex and gender and highlight the importance of understanding them as factors in health and disease. **Please note that each following example is just one of many possible examples for each area.**

To learn about the terms “sex” and “gender,” visit ORWH’s webpage [What are Sex & Gender?](#)



# Dimensions of Sex & Gender



## Terminology Note:

“Male” and “female” refer to sex assigned at birth. In addition, while we use the terms “male” and “female” for the purposes of this discussion, we recognize that sex is not a binary variable and variations do occur. These variations are called differences in sex development (DSD) or intersex conditions. For more information, visit the [website](#) of NIH’s Sexual & Gender Minority Research Office.



# Mental Health



## Influences of Sex

One example of how sex influences mental health is that the sex hormones estrogen and progesterone play a role in increasing the activity of key signaling molecules (including dopamine and serotonin) that affect mood. Variations in these sex hormones likely contribute to differences observed between male and female incidence rates of depression, as well as responses to treatment.

LeGates et al., 2019. PMID: [30082889](#)

## Influences of Gender

There are many ways in which gender influences mental health. For example, dominant **norms** of masculinity—such as self-reliance and toughness—have been shown to negatively influence boys' and men's willingness to seek mental treatment. Gender-based violence (**power, relations**) is associated with an increase in post-traumatic stress, anxiety, and depressive disorders in women.

Riecher-Rössler, 2017. PMID: [27856397](#)

Milner et al., 2019. PMID: [31690213](#)

# Substance Use Disorders



## Influences of Sex

Because of sex differences in **physiology** and **anatomy**, consumption of alcohol leads to greater blood alcohol concentrations and intoxication in females compared with males. The male metabolism of alcohol is more rapid than the female metabolism of alcohol because on average, females have less total body water than males, which affects the distribution of alcohol after absorption.

McHugh et al., 2018. PMID: [29174306](#)



## Influences of Gender

**Gender relations**—particularly in intimate partnerships—have been shown to influence substance use. For example, many women who begin using injection drugs have been influenced by a male partner. **Gendered power dynamics** can also make it difficult for women to leave unsafe relationships with partners who use drugs or drink excessively.

Meyers et al., 2020. PMID: [31625809](#)  
Wechsberg et al., 2013. PMID: [23927691](#)

# Cardiovascular Health



## Influences of Sex

The **sex hormone** estrogen plays a protective role in female cardiovascular function by promoting vasodilation (relaxation of blood vessels) and lowering blood pressure. After menopause, when the amount of circulating estrogen declines, the risk of cardiovascular disease increases in the female population and becomes similar to that seen among males.

Ji et al., 2021. PMID: [33587655](#)

El Khoudary et al., 2020. PMID [33251828](#)



## Influences of Gender

Many women experience a heightened awareness of potential physical and sexual threats, including street harassment and violence. These threats create barriers to women's participation in physical activity, which is important for lowering cardiovascular risk. For example, women are less likely than men to exercise in public or ride a bike through a city.

O'Neil et al., 2018. PMID: [29459471](#)

# Autoimmune Diseases



## Influences of Sex

The female immune system is generally more robust than the male system, with higher levels of circulating antibodies and greater cytokine release in response to infection. This difference in immune function, as well as **genetic factors**, contributes to the disproportionate prevalence of autoimmune diseases in females.

Billi et al., 2019. PMID: [30394940](#)



## Influences of Gender

**Gender norms** related to femininity—including the perception that women are more emotional than men—have been shown to contribute to frequent misdiagnosis of autoimmune symptoms. For example, systemic lupus erythematosus (SLE) is often misdiagnosed as hypochondria or anxiety in women, leading to delays in diagnosis and treatment.

Sloan et al., 2020. PMID: [32373774](#)

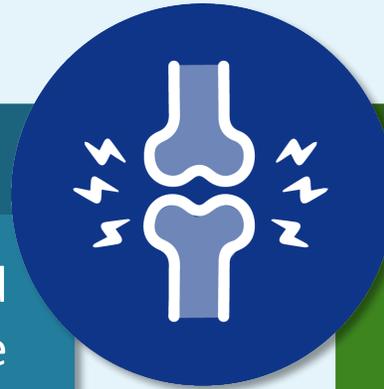
# Chronic Pain



## Influences of Sex

Pain processing differs within male and female nervous systems. For example, the **sex hormone** testosterone, which is present in higher levels in males, has a protective function against pain. In addition, **genetic factors** may contribute to differences in pain receptors that influence pain sensitivity. These sex differences affect the efficacy of treatments for pain, which are often less effective for female patients.

Bartley & Fillingim, 2013. PMID: [23794645](#)  
Farkouh et al., 2021. PMID: [33916167](#)



## Influences of Gender

**Gender roles and norms** have been shown to affect the diagnosis, treatment, and experience of pain in many ways. For example, women reporting their symptoms may be dismissed as “hysterical” or “emotional,” leading to inadequate treatment for pain; men may be discouraged from seeking medical treatment based on gender norms of masculinity that emphasize toughness.

Samulowitz et al., 2018. PMID [29682130](#)

# Environmental Exposures



## Influences of Sex

Access to neighborhood green spaces is a vital component of the built environment. Emerging research suggests that higher neighborhood greenness in areas with low levels of airborne particulate matter is correlated with higher numbers of ovarian follicles (**anatomy** and **physiology**) and therefore a slower rate of female reproductive aging.

Hood et al., 2021. PMID: [33905704](#)



## Influences of Gender

**Gender norms** and structural sexism (**power**) contribute to occupational segregation of women in service professions, which influences environmental exposures. For example, most workers in nail salons are women (often low-income and immigrant women), and they are disproportionately exposed to endocrine-disrupting phthalates in the workplace.

Varshavsky et al., 2020. PMID: [31906553](#)

# Trauma and Violence



## Influences of Sex

Chronic exposure to sexual abuse has been found to be associated with an increase in inflammation and impaired wound healing in the female genital tract (**anatomy** and **hormones**). The resultant female-specific immune dysregulation can result in greater susceptibility to HIV infection.

Ghosh et al., 2018. PMID: [29894487](#)  
Derry et al., 2021. PMID: [34589822](#)



## Influences of Gender

Women experience greater rates of severe physical and/or sexual violence perpetrated by an intimate partner than men, a disparity that is influenced heavily by **gender roles**, **gender norms**, and **gendered power dynamics**. In addition, structural and community-level gendered power dynamics often converge to discourage women from reporting abuse.

Centers for Disease Control and Prevention, "Preventing Intimate Partner Violence"  
Decker et al., 2019. PMID: [31214974](#)

# Female-Specific Conditions



## Influences of Sex

**Anatomical** differences contribute to a higher prevalence of bladder infections in female patients. Because the female urethra is shorter than that of the male, bacteria have less distance to travel to reach and infect the bladder. In addition, the opening to the female urethra is closer to the rectum, a source of many bacteria that commonly cause bladder infections.

National Institute of Diabetes and Digestive and Kidney Diseases, "Definition & Facts of Bladder Infection in Adults"



## Influences of Gender

Social and cultural stigma around menstruation is one example of how **gender norms** can impact health and wellbeing. For example, stigma around menstrual disorders and dismissal of women's pain as emotional rather than physical have been associated with delayed diagnosis of endometriosis (a menstrual disorder that affects roughly 10% of reproductive-age women) for as long as 11 years from the onset of symptoms, postponing treatment and the alleviation of symptoms.

Sims et al., 2021. PMID: [34360501](#)

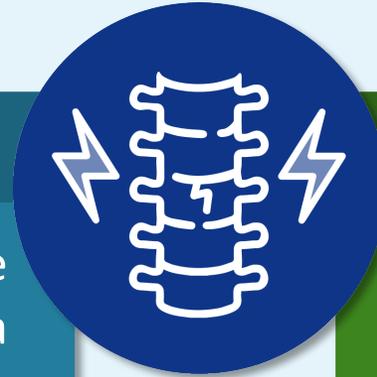
# Musculoskeletal Health



## Influences of Sex

Differences between male and female musculoskeletal systems can influence a person's risk of certain types of injuries. For example, differences in male and female knee and hip **anatomy** include leg muscle strength and tendon and ligament laxity. These anatomic differences are associated with higher risk of anterior cruciate ligament (ACL) injuries for girls and women.

Lin et al., 2018. PMID: [29550413](#)



## Influences of Gender

Musculoskeletal health can be influenced by cultural expectations of **gender expression** and **norms** of femininity. Women are often encouraged or required to wear and walk in high-heeled shoes, which contributes to the increased risk for women of developing osteoarthritis later in life because walking in high heels puts excess stress on knee joints.

Titchenal et al., 2015. PMID: [25532875](#)

# Cancer



## Influences of Sex

Because of differences in **anatomy**, some cancers are sex specific. For example, prostate cancer only affects males and ovarian cancer only affects females. In addition, sex differences in the metabolism of chemotherapy drugs influence the severity of side effects—such as significant decreases in white blood cell counts, which more commonly occur among female patients.

Siegel et al., 2022. PMID: [35020204](#)



## Influences of Gender

A cancer diagnosis is one of the most common medical conditions that require adult caregiving. Because of **gender roles and norms**, women provide most of the paid and unpaid acts of caregiving. Women who are caregivers of a spouse with cancer generally experience higher levels of stress, depression, and anxiety compared with men.

Ketcher et al., 2020. PMID: [31845168](#)



# References

- [1] Mayo Clinic. (n.d.). *Depression in women: Understanding the gender gap*. Retrieved January 18, 2023, from <https://www.mayoclinic.org/diseases-conditions/depression/in-depth/depression/art-20047725>
- [2] American Heart Association. (2020, November 30). *Women found to be at higher risk for heart failure and heart attack death than men*. <https://newsroom.heart.org/news/women-found-to-be-at-higher-risk-for-heart-failure-and-heart-attack-death-than-men>
- [3] Fairweather, D., & Rose, N. R. (2004). Women and autoimmune diseases. *Emerging Infectious Diseases*, 10(11), 2005–2011. <https://doi.org/10.3201/eid1011.040367>
- [4] International Association for the Study of Pain. (n.d.). *Female pain issues*. Retrieved January 19, 2023, from <https://www.iasp-pain.org/advocacy/global-year/pain-in-women/>