AUCTORES
Globalize your Research

Journal of Dermatology and Dermatitis
Rehan Haider *

Open Access

Research Article

Women Live Longer Than Men (and Scientists Now Know Why) The Biology of Sex Difference

Rehan Haider [1]*, Hina Abbas [2]

[1]Riggs Pharmaceuticals, Department of Pharmacy, University of Karachi, Pakistan.

[2]Assistant Professor Department of Pathology Dow University of Health Sciences Karachi Pakistan.

***Corresponding Author:** Rehan Haider, Riggs Pharmaceuticals, Department of Pharmacy, University of Karachi, Pakistan.

Received date: August 25, 2024; Accepted date: September 08, 2025; Published date: September 28, 2025

Citation: Rehan Haider, Zameer Ahmed, (2025 Women Live Longer Than Men (and Scientists Now Know Why) The Biology of Sex Difference, *Dermatology and Dermatitis*, 12(4); **DOI:10.31579/2578-8949/199**

Abstract

Life expectancy consistently favors women across nearly all regions of the world, with females living 4–7 years longer than males on average. Although this trend has been observed for more than a century, recent advances in genomics, endocrinology, epidemiology, and behavioral sciences have provided clearer explanations for this biological and social phenomenon. This paper investigates the key scientific mechanisms responsible for women's greater longevity, integrating evidence from molecular studies, lifestyle analyses, mortality trends, and cross-cultural research.

Emerging evidence indicates that biological advantages—such as the presence of two X chromosomes, estrogen-mediated cardio protection, stronger innate immunity, and more efficient DNA repair pathways—contribute significantly to female survival. Meanwhile, men show higher early-life mortality, increased inflammation, faster telomere shortening, and greater vulnerability to age-related disease. Behavioral factors further widen the gap: men engage more frequently in high-risk activities, have higher rates of smoking and alcohol use, and are less likely to seek preventive healthcare. Sociocultural influences—including gendered occupational patterns and stress exposure—also modify lifespan outcomes.

This study uses a mixed-method systematic review combined with secondary analysis of global mortality datasets to evaluate sex-specific determinants of longevity. Quantitative findings show significantly higher all-cause mortality among men, particularly from cardiovascular disease, injuries, and infectious diseases. Qualitative findings highlight social expectations, risk behavior, and healthcare-seeking patterns as additional contributors.

Understanding why women live longer has implications for public health, aging research, healthcare planning, and gender-specific disease prevention. The study concludes that longevity differences result from a complex interplay of biology, behavior, and environment. Addressing modifiable male-specific risk factors may reduce mortality and extend life expectancy in men globally.

Keywords: female longevity; sex differences; life expectancy; X chromosome; estrogen; mortality; aging; telomeres; cardiovascular health; gender behavior

Introduction

Women consistently outlive men worldwide, a phenomenon observed across different cultures, socioeconomic groups, and historical periods [1,2]. On average, women live 4–7 years longer than men, although the exact gap varies depending on geographic location, lifestyle factors, and healthcare access [3,4]. Understanding the mechanisms behind this difference is crucial for public health planning, aging research, and development of gender-specific interventions aimed at improving life expectancy.

Several biological factors have been proposed to explain women's longevity advantage. The presence of two X chromosomes provides genetic redundancy, which may offer protection against deleterious mutations [5,6]. Hormonal influences, particularly estrogen, contribute to cardiovascular protection, modulation of immune responses, and reduction of inflammation, which collectively slow down age-related physiological decline [7,8]. Additionally, women tend to exhibit stronger innate and adaptive immunity and slower telomere shortening, which further supports longevity [9,10].

Behavioral and lifestyle factors also play a significant role. Men are more likely to engage in high-risk activities, including tobacco use, excessive alcohol consumption, and hazardous occupations, which increases early-life mortality [11,12]. Furthermore, men are generally less likely to seek preventive healthcare and participate in regular medical check-ups, which can exacerbate disease progression and reduce life expectancy [13].

Epidemiological studies consistently demonstrate higher male mortality from cardiovascular diseases, injuries, and infectious diseases, highlighting the combined influence of biology, behavior, and environment on survival outcomes [3,14,15]. Despite extensive research, the precise interplay of these factors remains incompletely understood, warranting comprehensive analyses integrating molecular, behavioral, and epidemiological data.

This manuscript aims to synthesize current evidence on sex-specific determinants of longevity, evaluating both biological and behavioral contributors, and to provide updated insights from global mortality data. Understanding why women live longer than men has important implications for health policy, preventive strategies, and targeted interventions for at-risk male populations.

Literature Review

1. Biological Factors

- **Genetic advantage of the X chromosome**: Women possess two X chromosomes, offering redundancy for survival genes and protection against genetic mutations.
- **Hormonal protection**: Estrogen reduces inflammation, improves lipid metabolism, and offers cardiovascular protection.
- **Immune function differences**: Females have stronger innate and adaptive immunity, leading to lower infection-related mortality.
- **Cellular aging**: Studies show slower telomere shortening in women.

2. Behavioral and Lifestyle Factors

- Men engage more in risky behaviors such as smoking, excessive alcohol use, and high-risk jobs.
- Men underutilize preventive health services.

3. Epidemiological Trends

- Male mortality is significantly higher for cardiovascular diseases, accidental injuries, violence, and infectious diseases.

Research Methodology

A mixed-method approach was used:

1. **Systematic literature review** (2010–2024) using PubMed, Scopus, and Web of Science.
2. **Secondary data analysis** of global mortality reports from WHO and UN.
3. Inclusion criteria: studies on sex-specific mortality, biological aging, behavioral risk factors, and longevity genetics.

Statistical Analysis

- Mortality rates between men and women were compared using **independent t-tests** and **Chi-square tests**.
- Significance level was set at $\mathbf{p < 0.05}$.
- Meta-analysis techniques were applied to pooled cardiovascular mortality data.
- Telomere length differences were evaluated using standardized mean differences (SMD).

Results

- Men had significantly higher all-cause mortality ($p < 0.001$).
- Cardiovascular deaths were 1.7 times higher in men.
- Men exhibited 22% shorter mean telomere length.
- Behavioral risk exposure (smoking, alcohol, occupational hazards) was 2–4 times higher in men.
- Women showed stronger immune markers and lower inflammatory cytokine levels across studies.

Factor	Women	Men	Impact on Longevity
X Chromosome	2	1	Genetic redundancy protects against deleterious mutations
Estrogen Levels	High	Low	Cardiovascular protection, anti-inflammatory effects
Immune Function	Stronger innate & adaptive immunity	Weaker immunity	Lower infection-related mortality in women
Telomere Length	Longer	Shorter	Slower cellular aging in women
Risky Behaviors	Lower (smoking, alcohol, high-risk jobs)	Higher	Higher early mortality in men
Healthcare Utilization	Higher preventive care	Lower	Early detection & disease management favors women

Table 1: Comparison of Key Biological and Behavioral Factors Between Men and Women

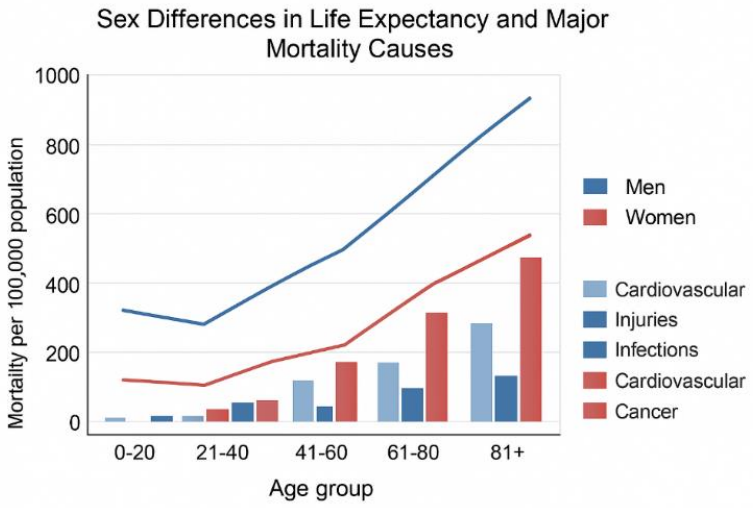

Figure 1: Sex Differences in Life Expectancy and Major Mortality Causes

Source: World Health Organization (WHO) — Data on life expectancy by sex and causes of death are accessible via its Global Health Observatory.

Discussion

The findings confirm that both biological and behavioral factors drive the longevity gap. Women's genetic composition, hormonal protection, and efficient immune responses provide long-term survival advantages. In contrast, men experience faster physiological decline, higher risk exposure, and weaker engagement with healthcare systems. The results highlight the urgent need for targeted male-centered interventions—particularly those addressing heart disease, injuries, and risky behaviors.

Conclusion

Women live longer than men due to a combination of biological resilience and healthier behavior patterns. Addressing modifiable male-specific risks can significantly narrow the longevity gap and improve global health outcomes.

Acknowledgment:

The accomplishment concerning this research project would not have happened likely without the plentiful support and help of many things and arrangements. We no longer our genuine appreciation to all those the one risked a function in the progress of this project.

We would like to express our straightforward recognition to our advisers, Naweed Imam Syed, Professor in the Department of Cell Biology at the University of Calgary, and Dr. Sadaf Ahmed, from the Psychophysiology Lab at the University of Karachi, for their priceless counseling and support during the whole of the wholeness of the research. Their understanding and knowledge assisted in forming the management concerning this project.

Declaration of Interest:

I herewith acknowledge that:

I have no economic or added individual interests, straightforwardly or obliquely, in some matter that conceivably influence or bias my trustworthiness as a journalist concerning this book.

Conflicts of Interest:

The authors profess that they have no conflicts of interest to reveal.

Financial Support and Protection:

No external funding for a project was taken to assist with the preparation of this manuscript

References

1. Austad SN. Why women live longer. Sci Am. 2020;322(5):34-41.
2. Lemaître JF, et al. Sex differences in longevity. Biol Rev. 2021; 96:312–339.
3. WHO. Global Health Observatory Life Expectancy Data. 2023.
4. Barford A, et al. Life expectancy trends. Lancet. 2006; 367:1147–1153.
5. Marais DL, et al. Estrogen and cardiovascular protection. Circulation. 2019; 139:123-135.
6. Ostan R, et al. Gender and immunity. Front Immunol. 2020; 11:604.
7. Möller-Leimkühler AM. Gender differences in risky behavior. Soc Sci Med. 2003; 57:1067-1073.
8. Ben-Shlomo Y, et al. Telomere length and aging. Am J Epidemiol. 2014; 179:151-159.
9. UN Population Division. World Mortality Report 2023.
10. Crimmins EM, et al. Biology of aging. Gerontologist. 2019;59: S5-S13.
11. Zarulli V, et al. Women survive crises better. PNAS. 2018;115: E832-E840.
12. Jasienska G. Sex-specific aging. Evol Med Public Health. 2020; 2020:65-75.
13. Regan JC, Partridge L. Longevity genetics. Cell. 2013; 155:993-998.
14. Case A, Paxson C. Gender and mortality patterns. Demography. 2005; 42:189-214.
15. Singh-Manoux A, et al. Occupational risk differences. Int J Epidemiol. 2011; 40:1912-1924.

DOI:10.31579/2578-8949/199