Perkins&Will

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Designing for Her

Women's Health Across the Lifespan in the Built Environment

Diagnosing the Problem

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About the Human Experience (Hx) Research Team at Perkins&Will

For more than forty years, research has demonstrated the important impact of buildings and urban design on human health and performance. The Hx team integrates this research into the design process to improve environmental quality, respond to human health emergencies, and ensure occupants are functioning optimally. We explore design strategies for diverse spaces including clinical, academic, and workplace using bespoke surveys and tailored sensor applications. With collaborations and cutting-edge tools, we are demonstrating the value of human-centered design.

Author's Note:

This paper recognizes that male and female individuals differ in meaningful ways due to a combination of genetic and hormonal factors. To fully understand and address these differences, it is important to distinguish between sex and gender and recognize their distinct impacts on health.

- Sex refers to biological differences
- Gender encompasses the complex psychosocial dimensions of identity—including self-perception, attitudes, societal expectations, behaviors, and life experiences (Reale et al., 2023).

Research has shown that many aspects of brain structure and function vary between sexes. These differences are critical, as they contribute to the varying prevalence, presentation, and treatment responses of numerous physiological and developmental conditions between men and women. Ignoring these sex-based variations in brain anatomy, physiology, and neurochemistry risks oversimplifying health strategies and limiting the effectiveness of care (Szadvári, 2023).

This paper distinguishes between sex and gender. Terms such as "female" and "male" refer to biological sex unless otherwise specified. In contrast, references to "women" and "men" pertain to gender identity, lived experience, and/or societal roles. We affirm the identities and experiences of transgender, nonbinary, and gender-diverse individuals. References to sex are not intended to disregard or invalidate these realities. When citing external sources that use the terms "women" or "men," we retain their original language for accuracy while acknowledging the limitations of binary terminology.

When referring to female bodies we will use she/her/hers/they/them pronouns and for male bodies, we will use he/him/his/they/them pronouns.

Contents

Executive Summary

This white paper explores how the built environment impacts women's health across their lifespan—and why current design practices, codes, and standards fail to meet their needs. Despite making up nearly half the U.S. workforce—and the vast majority of professionals in K–12 education, healthcare, and caregiving—women still work in spaces designed around outdated, male-centered norms. This is not just a design oversight, but justice issue, with far-reaching consequences for public health, productivity, and gender equity.

Our research shows that many indoor environments—classrooms, offices, restrooms, and recovery spaces—do not account for the physical, hormonal, and social changes women experience throughout their lives. When thermal settings ignore metabolic differences, when lighting worsens migraines, and when restrooms lack menstrual, pregnancy, or postpartum accommodations, women are subjected to systems never built for them.

This work is grounded in over 90 sources, including peer-reviewed research, government labor statistics, global health data, and design policy standards. These sources span more than 15 disciplines—public health, architecture, neuroscience, endocrinology, occupational medicine, environmental psychology, anthropology, gerontology, gender studies, ergonomics, and biostatistics—ensuring a scientifically rigorous and practically relevant foundation for design, policy, and public health. The paper outlines sex-based physiological and hormonal differences and tracks their physical, mental, and social effects across five key life stages of women: puberty, reproductive years, pregnancy/postpartum, perimenopause/menopause, and post-menopause.

Yet a major research gap persists in understanding how design impacts women's health across these life stages. Most design standards overlook biological and occupational realities—resulting in environments that fail to support comfort, dignity, or retention. There's limited data linking design features to outcomes like fatigue, stress, and thermal discomfort.

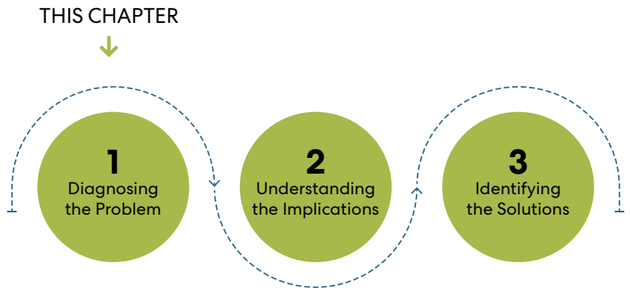
Architecture and interior design continue to lag behind other disciplines in addressing this gap. By designing for privacy, flexibility, rest, and resilience, to name a few, the built environment can shift from being a barrier to becoming a powerful promoter of women's health and equity.

Since 1950, the number of women in the U.S. labor force has increased significantly—from about 18 million (roughly 30% of the workforce at the time) to over 72 million in 2020, making up nearly 47% of all workers (U.S. Bureau of Labor Statistics, 2020). That tells us that the women in the labor force have been steadily catching up to the men in the labor force, but design standards still reflect a male-default. When we design for female bodies without accounting for their full biological and developmental realities, we risk designing against them. From temperature discomfort to injury risk, from cognitive fatigue to chronic illness—these unseen factors shape how women move through the world. To build supportive environments, we must start designing for the full arc of female development—not just for today's needs, but for the decades of change to come. We argue that age- and sex-specific design is no longer optional—it's a fundamental requirement for achieving health equity in the built environment.

Our Series Framework

This series seeks to reframe women's health as a core design issue through three guiding chapters:

1. **Diagnosing the Problem:**
   - What exactly are the physiological differences separating men and women's needs for the built environment, and how do they change across women's lifespans and from person to person?
2. **Understanding the Implications:**
   - What are the potential economic consequences for everyone when we do not consider design issues for women's health?
3. **Identifying the Solutions:**
   - What is the role of design in all of this? And what can designers, engineers, policymakers, and educators do to ensure that spaces are designed inclusively?



By the Numbers:

72 million
women were employed in the U.S. in 2020 (U.S. Bureau of Labor Statistics, 2020).

47%
of the 2020 workforce was comprised of women (U.S. Bureau of Labor Statistics, 2020).

76.5%
of public school teachers are female (U.S. Department of Education, National Center for Education Statistics [NCES], 2019).

76%
of healthcare workers are female (U.S. Census Bureau, 2019).

1 in 4
women considered resigning due to menopause (SimplyHealth, 2023).

1 Diagnosing the Problem

Our standards weren't built for everyone.

For decades, design and engineering guidelines used male characteristics as the default. They assumed a human body was tall, strong, thermally fixed, and hormonally stable. We know from qualitative and quantitative research that this is not the full story.

Introduction

The spaces we design shape the lives we live. Whether in schools, workplaces, neighborhoods, or public spaces, the built environment plays a profound role in promoting—or hindering—our physical, mental, and social well-being.(Mujan et al., 2019; Samet & Spengler, 2003). A growing body of research supports the connection between our surroundings and our health behaviors (S. C. Brown et al., 2009; Frumkin, 2003; Sallis et al., 2012; Villanueva et al., 2025). Yet despite decades of progress in public health and environmental design, many spaces still reflect a one-size-fits-all approach—failing to meet the needs of individuals across different ages (Ismail et al., 2023; Jian et al., 2025), sexes (Okabe et al., n.d.; Szadvári, 2023; Xie et al., 2023), and their distinct needs.

This first chapter begins by diagnosing a critical blind spot in design: the ways women's bodies and health journeys remain poorly understood, underrepresented, or entirely excluded from the environments they move through each day.

All of us grow. We get taller, we undergo neuron pruning, and we reach biological maturity. **But for women, development doesn't stop there.**

Despite shaping nearly every sector of the workforce, women's physiological realities remain sidelined in many codes, standards, and design assumptions—rendering them invisible in the very spaces they navigate. Design, historically, has centered around the average male body, excluding the physiological needs and lived experiences of women. From puberty to post-menopause, female bodies experience a cascade of hormonal, physiological, and neurological transitions—each with profound effects on physical and mental health. These layers of change are often invisible in daily life, yet they shape everything from sleep quality and emotional regulation to bone density, injury risk, and chronic illness. And still, these realities are **largely ignored in design standards—not because they're insignificant, but because they've remained unseen, unmeasured, and unspoken.**

Realities Women Face:

Thermal comfort standards like American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 55 were historically based on male bodies, **leading to overcooling for women in workplaces** (Kingma & Van Marken Lichtenbelt, 2015; ASHRAE, 2021). While no longer part of the International Energy Conservation Code (IECC) 2024, these defaults still shape Heating, Ventilation, and Air Conditioning (HVAC) design, and current IECC codes offer no guidance for adjusting to women's hormonal or metabolic needs.

Restroom layouts fail to meet actual demand. **Women experience significantly longer wait times than men**, yet the Uniform Plumbing Code (UPC) still relies on equal fixture counts rather than equal access time, falling short of achieving true "potty parity" (Huh et al, 2019).

Classroom acoustics tend to support lower male vocal ranges, making **female voices harder to hear in reverberant settings** (Prodi et al., 2019).

These are not minor oversights; they are measurable, systemic gaps that degrade comfort, performance, and equity. This chapter brings them into focus—not only to measure where the built environment falls short, but to set the stage for reimagining what design could do differently.

The Built Enviroment Shapes Our Lives, But Not Equally

Let's start with what should be obvious: female bodies are physically and hormonally distinct from male bodies, as well as from one another. Yet most built environments still operate on outdated assumptions that treat all bodies the same. As we begin to diagnose the problem, it becomes clear: our spaces were rarely designed with women's full biological and developmental arcs in mind. Until we recognize that these design gaps are measurable—and fixable—we risk reinforcing systems that exclude and devalue half the population.

What Differences Exist?

Designing for health and equity begins by acknowledging that the built environment is not neutral; it reflects the values, bodies, and assumptions of those who shape it. When sex-based differences are ignored, buildings unintentionally create daily friction: discomfort at desks and waiting rooms, thermal stress in offices, and acoustical strain in classrooms. These aren't minor oversights—they are design decisions with real impacts on comfort, health, and productivity. While there has been growing awareness and some progress— such as the adoption of gender-neutral restrooms and updates to equipment standards to reflect a broader range of body sizes (National Center for Transgender Equality, 2019), most systems still fail to account for the distinct changes and challenges women face across life stages. From menstruation and pregnancy to menopause and beyond, women's bodies are not static. Designing equitably means considering not just female anatomy, but also the hormonal, metabolic, and functional changes women navigate throughout life. On top of that, no two women experience these stages the same way. With consideration of intersectionality, race, neurodiversity, disability, trauma history, and cultural norms all shape how individuals interact with and move through space. If designers want to build truly inclusive environments, they must move beyond "average user" assumptions and design for the full spectrum of human experience.

These realities demand more than policy reform—they call for a fundamental shift in how we approach design.

Architecture, interiors, and spatial systems must treat physiological data as essential design criteria. The following sections highlight how biological differences between male and female bodies shape spatial experience and have been overlooked in design standards. By examining metabolism, thermoregulation, hormonal changes, and sensory responses, we gain critical insight into how the built environment can either support or strain the body. We then focus on women's health needs across key life stages, each presenting unique physical, mental, and social considerations that architecture must recognize for a foundational, inclusive, responsive, and evidence-based design.

Research Opportunity for the Future

This series is merely a starting point for further research as we explore the broad spectrum of human identity and consider how gender and LGBTQ+ experiences shape interactions with the built environment. Throughout this work, we encountered inconsistent terminology (e.g., male and female versus men and women), which complicates our understanding of the physiological versus social and behavioral impacts of design. For this reason, we want to be clear that this paper focuses specifically on physiological differences. However, the authors fully recognize that female bodies do not exist in absentia of the social constructs and pressures associated with femininity and womanhood today. We have deliberately limited our integration of research on transgender women, as the existing literature remains nascent and does not yet fully reflect the intersectional identities necessary to generalize findings across all built environments.

Responding to Physiological Differences

On a physiological level, male and female bodies differ in ways that directly influence how people experience the built environment. These differences aren't minor; they shape comfort, performance, and well-being across everyday spaces. Recognizing these sex-based differences is the first step toward creating spaces that are inclusive by default—not retrofitted. Equity in design begins with understanding these biological distinctions as essential design inputs, not afterthoughts.

Take **height and reach**: the average American woman stands 5'3" (160 cm), while the average American man is 5'9" (175 cm) (CDC, 2022). Yet anthropometric data used to determine reach ranges, shelf heights, counter dimensions, and equipment placement typically center male averages. This can create persistent accessibility issues for women in kitchens, classrooms, patient rooms, and workstations—forcing physical overreach or requiring assistance for everyday tasks.

Thermal comfort is another major domain where biological sex matters. Women have a basal metabolic rate that is, on average, 23% lower than men (Agin et al., 2023). They produce less body heat and are more sensitive to environmental temperature shifts, especially during menstruation, pregnancy, and menopause. Yet, thermal comfort standards like ASHRAE Standard 55 were historically based on the metabolic rate of a 40-year-old, 154 lb. man in a business suit. While ASHRAE 55 is no longer referenced in the IECC, its influence persists in professional practice, existing buildings, and product specifications. Moreover, the 2024 IECC still includes no mandates to consider hormonal or metabolic differences—overlooking half the population's thermal needs.

The **respiratory system** reveals further disparity. Women's lung capacity is approximately 25% smaller than men's, which impacts oxygen intake and pollutant tolerance (LoMauro & Aliverti, 2018). This means poor air circulation or high levels of indoor pollutants may disproportionately affect women's cognitive function and respiratory health. Notably, women experience a higher prevalence and severity of respiratory illnesses, influenced by biological and hormonal factors throughout their lives (Carey et al., 2007; Fuseini & Newcomb, 2017). Environments that fail to prioritize air quality—such as classrooms with stale air or workplaces with outdated HVAC—create uneven health burdens.

Acoustics matter, too. Women's voices have a higher average pitch (around 160-270 Hz vs. 85-175 Hz in men), and shorter vocal cords produce less sound energy (Pisanski et al., 2016). In spaces with long reverberation times or poor sound absorption, women's speech is more easily drowned, especially in classrooms, meeting rooms, or courtrooms.

Design That Fails Women, Fails Us All

In short, physiological differences are not just medical trivia—they are foundational to how people experience buildings. When design defaults to male norms, **it fails not only women—it fails everyone who sits outside the median.** An inclusive, evidence-based approach begins by treating biological data not as an afterthought, but as a baseline for design.

Key Physiological Realities Shaping Spatial Needs

Female	Male
Height and Body Mass • Shorter average height • Lower overall body mass • Higher proportion of body fat, concentrated in hips, thighs, and breasts	**Height and Body Mass** • Taller average height • Greater overall body mass
Skeletal • Smaller, lighter bones • Bones influenced by hormone levels, sharp bone loss after menopause	**Skeletal** • Larger, denser bones • Male pelvis built more for load-bearing and locomotion efficiency • Gradual bone loss with age
Respiratory Health • Smaller Airway Diameter, tidal volume and lung volume • Greater respiratory muscle fatigue • Reduced oxygen efficency	**Respiratory Health** • Larger lung volume • Greater oxygen uptake capacity
Vocals • Higher vocal pitch due to shorter, faster-vibrating vocal cords	**Vocals** • Lower vocal pitch due to longer, slow-vibrating vocal cords
Basal Metabolic Rate • Lower BMR • More efficient fat metabolism	**Basal Metabolic Rate** • Higher BMR, influenced by lean mass
Surface Area-to-Volume Ratio • Higher surface area-to-volume ratio, contributing to greater thermal sensitivity • Similar to children, making them more vulnerable to dehydration and temperature changes	**Surface Area-to-Volume Ratio** • Lower surface area-to-volume ratio, facilitating more effective heat dissipation

Tracking Lifespan Differences

Women's health and physiological needs shift significantly across the life course—from puberty to post-menopause. Hormonal changes during each of these transitions influence metabolism, thermoregulation, bone density, cognition, mobility, and more. These shifts can shape how women experience lighting, acoustics, air quality, furnishings, and accessibility. Designing environments without acknowledging these transitions means ignoring core aspects of women's health and comfort. A life stage-informed approach recognizes that equitable design must evolve alongside the people it serves—supporting women through every phase, not just as workers or users, but as whole, changing individuals across time.

Key Sex Hormones in Women: Why they matter

Estrogen

Supports reproductive health, regulates menstrual cycles, maintains bone density, and affects mood, cognition, and skin elasticity. Sharp declines during menopause are linked to hot flashes, osteoporosis, and heart disease risk.

Progesterone

Essential for regulating the menstrual cycle and supporting pregnancy. Fluctuations can influence sleep, mood, and anxiety levels—especially in the luteal phase and postpartum.

Testosterone

Often overlooked in women, but plays a role in muscle mass, libido, energy levels, and cognitive sharpness. Levels decline with age, especially after menopause.

FSH & LH (Follicle-Stimulating Hormone & Luteinizing Hormone)

Regulate ovulation and reproductive cycles. Disruption in these can signal fertility issues or hormonal disorders like PCOS.

Oxytocin

Known as the "bonding hormone," it rises during childbirth and breastfeeding, but also supports stress regulation and social bonding throughout life.

(Klein & Flanagan, 2016; Stuenkel et al., 2015)

Sex-Based Physiological Differences Across the Lifespan

Female	Male
Early Adolescence/Puberty • Earlier puberty onset (~9-11) • Estrogen increases fat deposition • Begin menstruation; higher risk of anemia	**Early Adolescence/Puberty** • Later puberty onset (~11-13) • Greater lean muscle development • Higher testosterone
Adulthood (Reproductive Age) • Lower average resting metabolic rate (RMR): (1,348 ± 125 kcal/day) • Greater fat mass • Cyclical hormonal changes (estrogen/ progesterone).	**Adulthood (Reproductive Age)** • Higher average resting metabolic rate (1,740 ± 194 kcal/day), 23% more than women • More lean body mass • Less hormonal variability
Midlife Hormonal Transition • Sharp estrogen decline • Hot flashes and altered thermoregulation • Reduced bone density	**Midlife Hormonal Transition** • No sharp hormonal shifts • Gradual testosterone decline • Stable bone density until later age
Later Adulthood (Aging) • Postmenopausal decline in bone density (risk of osteoporosis) • Lower muscle mass • Longer life expectancy (~80 years)/US life expectancy • Live ~2.6 more years with chronic conditions	**Later Adulthood (Aging)** • Higher bone mass retention • More muscle mass • Shorter life expectancy (~74 years) / US life expectancy • Less frailty risk

Women's Health Needs from Puberty to Post-Menopause

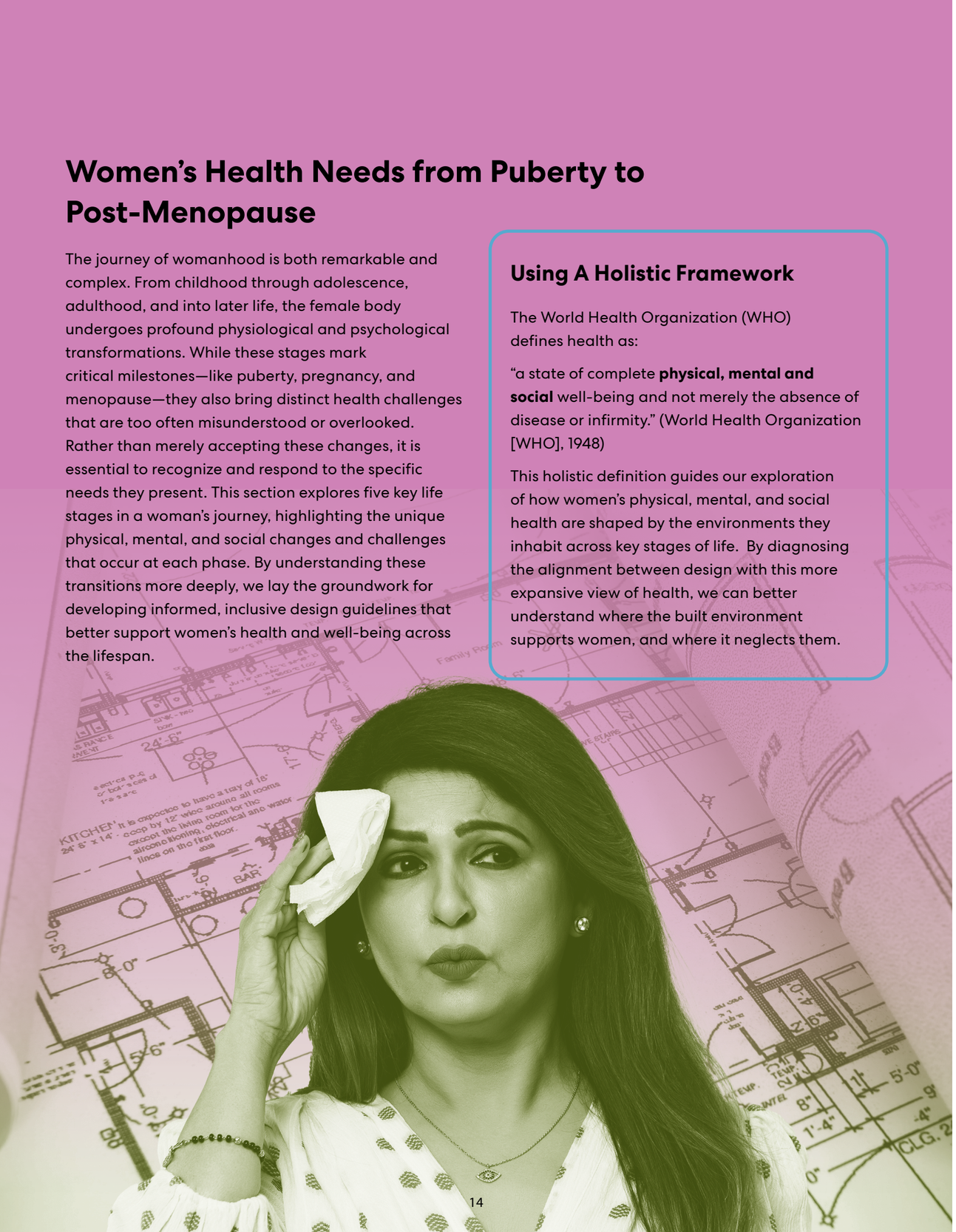
The journey of womanhood is both remarkable and complex. From childhood through adolescence, adulthood, and into later life, the female body undergoes profound physiological and psychological transformations. While these stages mark critical milestones—like puberty, pregnancy, and menopause—they also bring distinct health challenges that are too often misunderstood or overlooked. Rather than merely accepting these changes, it is essential to recognize and respond to the specific needs they present. This section explores five key life stages in a woman's journey, highlighting the unique physical, mental, and social changes and challenges that occur at each phase. By understanding these transitions more deeply, we lay the groundwork for developing informed, inclusive design guidelines that better support women's health and well-being across the lifespan.

Using A Holistic Framework

The World Health Organization (WHO) defines health as:

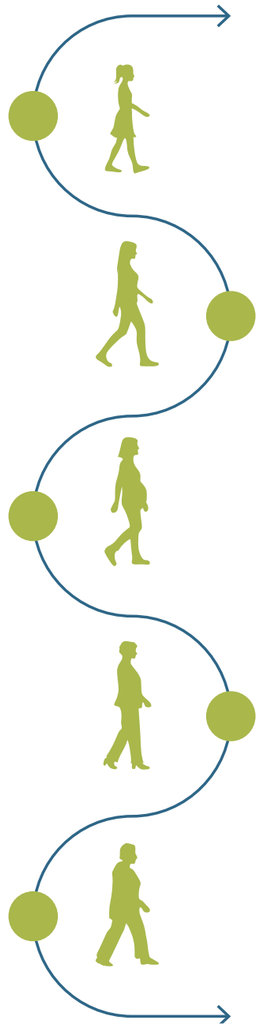
"a state of complete **physical, mental and social** well-being and not merely the absence of disease or infirmity." (World Health Organization [WHO], 1948)

This holistic definition guides our exploration of how women's physical, mental, and social health are shaped by the environments they inhabit across key stages of life. By diagnosing the alignment between design with this more expansive view of health, we can better understand where the built environment supports women, and where it neglects them.



Female Life Stage Definitions

Although earlier sections used general lifespan categories for females and males, the following uses Female-specific life stage terms.



Puberty and Menarche →

Puberty is the stage of development when the body transitions from childhood to physical and reproductive maturity.

Menarche refers to a girl's first menstrual period, signaling the onset of reproductive capability (Lee, 2020).

← Reproductive Age

The reproductive stage is marked by the body's ability to conceive and bear children. It includes regular menstrual cycles and the hormonal regulation of fertility and pregnancy potential (Merck Manuals, 2025).

Note: Pregnancy usually occurs during this stage; however, due to its significance in informing design decisions, it is discussed separately in the Pregnancy and Postpartum section.

Pregnancy and Postpartum →

Pregnancy is the physiological process during which a fertilized egg develops into a fetus within the uterus.

Postpartum refers to the period following childbirth when the body recovers physically and hormonally, often lasting six months to a year or longer.

← Perimenopause and Menopause

Perimenopause is the transitional phase leading up to menopause, during which hormone levels—especially estrogen and progesterone—fluctuate irregularly. Menopause is defined as the point when a woman has gone 12 consecutive months without menstruation, marking the end of reproductive capability (Yong et al., 2025).

Postmenopause →

Post-menopause refers to the life stage following 12 consecutive months without a menstrual period. Hormone levels stabilize at a new baseline, and long-term physiological effects of estrogen loss become more pronounced (Cleveland Clinic, 2025).

Note: Perimenopause and menopause are presented together in this section due to their overlapping symptoms and shared design implications.

Physical Wellbeing Across the Life Stages

Overview

Throughout her life, a woman's body undergoes significant physical changes—growth spurts, hormonal fluctuations, temperature sensitivity, shifts in mobility, and sensory decline. These transformations shape how she moves through, feels in, and responds to the built environment. By addressing the physical needs that emerge from puberty to post-menopause, we create environments that are not only inclusive of women but also healthier, safer, and more responsive for all. Designing for the body—especially one in constant transition—is essential to designing for humanity.

Puberty & Menarche

These physical considerations begin in puberty and menarche, the onset of menstruation, which are accompanied by rapid growth spurts. In K-12 settings, this might influence everything from furniture fit to locker room needs. Other physical changes like acne, body odor, and body hair are common, and about 60–88% of adolescent girls experience dysmenorrhea, or menstrual pain (Marques et al., 2022). Additionally, irregular menstrual cycles affect over 40% of girls, and early menarche is linked to higher risks of obesity. Hormonal changes can also influence thyroid function, which in turn affects mood, metabolism, and energy levels.

A 2024 study from Harvard's Apple Women's Health Study found that girls in the U.S. are getting their first period earlier than ever—many before age 12. The gap is widening with each generation, pointing to a growing public health concern. Early puberty is linked to increased risk of depression, anxiety, migraines, and other chronic conditions—yet design rarely accounts for these changes in schools or public environments. Black, Hispanic, and Asian girls are more likely to experience early menarche than white girls. Girls from lower socioeconomic backgrounds are disproportionately affected (Z. Wang et al., 2024).

Design Opportunities:

- Ensuring private, hygienic restrooms with access to menstrual supplies.
- Incorporating quiet or wellness spaces can support teens managing pain, fatigue, or emotional distress tied to hormonal fluctuations.

Reproductive Years

As women enter the reproductive age, monthly hormonal cycles influence energy levels, appetite, and body temperature. Many experience cramps, fatigue, migraines, or low blood pressure related to menstruation. Reproductive health conditions such as Polycystic Ovary Syndrome (PCOS), which affects up to 13% of reproductive-age women globally, and Premenstrual Dysphoric Disorder (PMDD), a severe form of PMS that affects up to 8%, can significantly impact physical wellbeing (WHO; Halbreich et al., 2003). These issues are compounded by the demands of work and caregiving, making access to supportive environments essential.

Design Opportunities:

- Provide restorative, ergonomic spaces in workplaces, public transit, and healthcare facilities.
- Reduce sensory stress by intentionally accounting for daylighting, glare, ventilation, and acoustics

Pregnancy and Postpartum

During pregnancy and postpartum, hormonal shifts intensify, causing nausea, fatigue, swelling, and overheating. A study of pregnant workers found that 30% reported the thermal environment as intolerable (Ni et al., 2024). Up to 70% of pregnant individuals experience musculoskeletal discomfort, especially back pain (MacDonald et al., 2024). In addition, the need for lactation spaces is critical. However, pregnancy loss, often overlooked, involves both physical and emotional recovery, requiring compassionate, flexible policies and environments in workplaces and healthcare settings. Inclusive design at this stage supports not only physical needs but also mental and emotional well-being.

Design Opportunities:

- Provide adaptable, supportive furniture such as seating with lumbar support, wider dimensions, and soft-edge surfaces.
- Offer private, hygienic, and comfortable nursing accommodations with appropriate lighting, seating, refrigeration, and signage.

Perimenopause and Menopause

The perimenopausal and menopausal transition, typically occurs when a woman enters her 40s and 50s. It is marked by hot flashes, night sweats, and temperature dysregulation, affecting about 30% of women (Yong et al., 2025). Hormonal decline accelerates bone loss—up to 20% can occur during this period—and leads to reduced muscle mass and joint pain. These changes affect mobility, balance, and increase fall risk. Furthermore, osteoporosis affects approximately 1 in 2 postmenopausal women, and the risk of fractures and falls significantly increases (Endocrine Society, 2022). Decreased bladder control and pelvic floor issues are also common. Sensory decline—including hearing and vision loss, which can increase by 10–29% in post-menopausal women—impacts spatial orientation and wayfinding (Svedbrant et al., 2015). Slower walking speeds and reduced balance further underscore the need for universal design elements that anticipate and accommodate aging-related changes.

Racial disparities persist into menopause experiences. Black women reach menopause an average of 8.5 months earlier than white women, sometimes beginning perimenopause in their late 30s or early 40s. They also report more intense and longer-lasting symptoms, with hot flashes and sleep disruptions often lasting 10+ years—twice as long as in white, Chinese, or Japanese women. For example, 46% of Black women experience vasomotor symptoms (e.g., hot flashes) vs. 37% of white women and are more likely to report heavier menstrual bleeding during perimenopause. It is also notable Black women are twice as likely as white women to undergo total hysterectomy, leading to earlier surgical menopause. (Harlow et al., 2022; Reeves et al., 2023). This means that the face of menopause may be younger than we often think and requires consideration in all built environments.

Design Opportunities:

- Use enhanced ventilation, user-controlled thermal systems, and well-placed rest areas help women manage temperature sensitivity and fatigue.

Post-Menopause and Aging

In post-menopause, there are multiple physical health considerations including decreased bladder control and pelvic floor issues. Osteoporosis affects about 1 in 2 postmenopausal women, significantly raising the likelihood of fractures and falls (Endocrine Society, 2022). Sensory decline including, hearing and vision loss, rises by 10–29% in postmenopausal women, impacting spatial orientation and wayfinding (Svedbrant et al., 2015). Slower walking speeds and reduced balance further highlight the need for universal design features that anticipate and accommodate aging-related changes.

Design Opportunities:

- Assess trip hazards, using non-slip flooring.
- Offer ample seating and handrails in public areas and restrooms.
- Incorporate clear wayfinding signage to enhance spatial orientation, appropriate lighting, auditory cues, and high-contrast materials support navigation and independence.

Mental Wellbeing Across the Life Stages

Overview

Mental health is shaped by environmental conditions such as lighting quality, noise levels, thermal comfort, and opportunities for rest. Across the lifespan, women experience hormonal fluctuations that affect mood, stress response, cognitive performance, and emotional regulation. These shifts, especially during adolescence, pregnancy, and the post-menopausal transition can heighten vulnerability to depression, anxiety, and sleep disturbances (Albert, 2015; Kundakovic & Rocks, 2022). Aligning spatial design with psychological needs can help create environments where women feel focused, calm, and supported at every stage.

Puberty & Menarche

The onset of menstruation is often accompanied by heightened emotional sensitivity and mood swings due to dramatic hormonal changes. During this time, girls are at elevated risk for depression and anxiety—particularly when hormonal shifts impact thyroid function, which regulates mood, energy, and metabolism. By ages 15–16, 21.6% of girls and 18.9% of boys experience depression (Wang et al., 2024). Feelings of confusion, and low self-esteem are also common as girls adjust to rapid physical changes. Yet most educational environments offer little psychological support or privacy, leaving students to manage stress and emotional overwhelm in settings designed without their needs in mind. Early puberty further heightens risk for migraines, mood disorders, and other chronic conditions, especially among marginalized populations, underscoring the urgent need for supportive, adaptable school design.

Design Opportunities:

- Include calming, low-stimulation spaces for emotional regulation and mental breaks.
- Design for choice and control, such as dimmable lighting or acoustic zoning, to reduce sensory overload.
- Biophilic elements such as natural light, calming color palettes, and greenery that support emotional regulation and reduce anxiety.

Reproductive Years

During the reproductive years, hormonal fluctuations across the menstrual cycle can significantly impact mood, cognition, and emotional regulation. Many women experience increased anxiety, irritability, and emotional sensitivity, especially during the luteal phase (Bäckström et al., 2014). Up to 80% report at least one emotional or physical symptom during this stage of the cycle (Hantsoo & Epperson, 2017). Conditions like Premenstrual Dysphoric Disorder (PMDD) and underlying thyroid dysfunction can intensify these challenges (Bäckström et al., 2014). For those navigating fertility challenges or irregular cycles, the psychological toll may include grief, isolation, or uncertainty, often compounded by a lack of privacy or supportive infrastructure in workplaces and public settings.

Design Opportunities:

- Embed access to counseling or wellness rooms into workplace or educational layouts.
- Create private, calming spaces for rest or self-regulation, accessible throughout the day.

Pregnancy & Postpartum

The transition into motherhood is one of the most emotionally complex periods in a woman's life. From early pregnancy through the months after birth, women face heightened vulnerability to mental health challenges as they navigate major physical changes, social role shifts, and caregiving demands. Nearly 1 in 5 women in the U.S. experience a mental health disorder during this stage—including prenatal or postpartum anxiety, depression, and trauma-related conditions (Fawcett et al., 2019). Fears about fetal health, labor, and parenting are common, often compounded by hormonal fluctuations and emotional sensitivity. Postpartum, women frequently report identity loss, cognitive fog, and isolation—especially in environments that fail to support rest, privacy, and recovery. The psychological impact of miscarriage, traumatic delivery, or emergency birth is often carried in silence, leaving little room for grief or healing. These are not peripheral issues, they are central to maternal well-being and demand greater recognition in how we design for care.

Design Opportunities:

- Ensure dignified, discrete access to lactation rooms, sanitary facilities, and flexible rest areas without stigmatizing signage or layout.
- Include wellness and recovery rooms in schools, clinics, and workplaces to support privacy, rest, and emotional processing.
- Create trauma-informed healthcare settings with visual and acoustic comfort, spatial dignity.

Perimenopause and Menopause

This stage marks a profound life shift—the end of menstruation and fertility, but also a redefinition of identity, purpose, and emotional resilience. As women enter this transition, they often face unexpected changes in mood, focus, and mental clarity. Nearly 47% report heightened anxiety, irritability, or emotional sensitivity, and many experience memory lapses or difficulty concentrating, often described as "brain fog" (Yong et al., 2025). Research shows that early perimenopausal women are significantly more likely to report depression and anxiety compared to those who are premenopausal (Kuck & Hogervorst, 2024). These shifts don't occur in isolation—they affect how women show up in work and social life, often without acknowledgment or support. The emotional toll of changing roles, the loss of reproductive identity, and cultural stigma around aging deepen feelings of vulnerability.

Design Opportunities:

- Ensure access to privacy-friendly restrooms or wellness rooms, especially during episodes of emotional distress or fatigue.
- Support cognitive clarity through intuitive wayfinding and clutter-free layouts.
- Reduce stigma by embedding visual and cultural cues that reflect menopause as a normal health transition, not a decline.

Post-Menopause and Aging

The post-menopausal stage often brings emotional shifts tied to aging, changing family roles, and evolving identities. This period may involve adjusting to an empty nest, retiring from long-held careers, or navigating the loss of a partner or close friends. These transitions can trigger persistent or late-onset depression and anxiety, particularly when compounded by chronic pain or disrupted sleep (Fani & Sharp, 2024). Mental fatigue becomes more common, and over time, the risk of cognitive decline rises, affecting approximately 4.5% of postmenopausal women with mild cognitive impairment over a five-year period (Conde et al., 2021). Despite these challenges, few environments offer design features that promote emotional ease, autonomy, or cognitive support. Without clear signals of care—such as wayfinding aids, restorative spaces, or inclusive programming—older women are left to navigate this life stage without the dignity or support they deserve.

Design Opportunities:

- Incorporate wayfinding features that assist with memory lapses or cognitive fatigue (e.g., color-coded signage, landmarks, simplified layouts).
- Include natural lighting and biophilic elements that support circadian rhythm, sleep quality, and mood regulation.

Social Wellbeing Across the Life Stages

Overview

Social wellbeing is the ability to build and maintain healthy relationships and have meaningful interactions with others from their colleagues to the community. Psychosocial shifts such as retirement, caregiving roles, or loss of social identity have been shown to impact emotional wellbeing (American Psychological Association, 2015). Environments that support mobility, sensory comfort, safety, and social connection are essential to promote long-term health and independence during this life phase.

Puberty & Menarche

Dramatic physical changes during the onset of menstruation can result in adverse social wellbeing outcomes including heightened self-awareness, body image concerns, and social anxiety (Lawal et al., 2020). Many adolescent girls struggle with peer comparison and feel pressure to conform to gender norms, affecting their confidence and ability to connect authentically with others (Irannezhad et al., 2024). Without adequate health education, misinformation and confusion about menstruation can increase distress and embarrassment, limiting a young girl's willingness to seek support. School absenteeism due to menstrual pain is not uncommon—about 8.7% of girls miss school as a result (Marques et al., 2022), leading to social exclusion and academic gaps. Additionally, increased body awareness during puberty, coupled with social pressures, raises the risk of disordered eating, further compromising both physical health and social wellbeing.

Design Opportunities:

- Provide encouraging, informative signage that reduces embarrassment and provides empowering knowledge void of weight- or diet-based talk.
- Provide private or semi-private eating nooks for those who may be sensitive to social judgment.

Reproductive Years

During the reproductive years, women often face silence or discomfort around menstruation and fertility, especially in workplaces and academic environments that lack private or supportive spaces. These unspoken realities can make it difficult for women to advocate for their needs, straining relationships with colleagues and perpetuating stigma (Van Lonkhuijzen et al., 2023). For those experiencing fertility struggles or managing conditions like endometriosis or polycystic ovarian syndrome (PCOS), the absence of social acknowledgment or institutional support can be profoundly isolating (Dewani et al., 2023). The stress of balancing reproductive health, work demands, and caregiving responsibilities can limit social engagement and leave women feeling overwhelmed and unsupported.

Design Opportunities:

- Provide calm, inclusive lounges or breakout areas to support community, peer support, and mental wellness to address recurring or chronic pain.
- Go beyond restroom design and create restorative spaces and nooks using soothing, biophilic palettes, textures, and soundscapes to reduce stress.

Pregnancy & Postpartum

Pregnancy and the postpartum period are deeply social experiences—but they're not always supported as such. Many public and workplace environments lack basic amenities like lactation rooms or rest areas, making it harder for women to stay connected while caring for their health and their child. At the same time, societal ideals around motherhood, body image, and productivity can lead to shame and guilt, especially when experiences don't match cultural expectations (Sutherland, 2010). Isolation is common during postpartum, due to reduced mobility, sleep deprivation, and caregiving demands (Jackson et al., 2024). The silence surrounding miscarriage and postpartum mental health struggles further compounds this, leaving many women without community or emotional support at a critical time. The lack of open dialogue about these experiences reinforces stigma and limits the formation of compassionate, supportive networks.

Design Opportunities:

- Integrate discrete, comfortable lactation and recovery spaces that are easy to access without navigating public or high-traffic zones.
- Design adaptable spaces that support both quiet solitude and small group interaction—accommodating the emotional range of early parenthood.
- Use inclusive signage and language that normalizes postpartum needs (rest, nourishment, emotion regulation), helping to reduce stigma around asking for support.

Perimenopause and Menopause

As women enter perimenopause and menopause, they encounter new layers of social stigma. A large survey found that more than half of women do not feel comfortable discussing menopause at work because it feels "too personal," and very few have spoken to HR about it (Break through the Stigma: Menopause in the workplace, 2023). Physical symptoms like hot flashes, fatigue, and mood shifts are rarely discussed openly, especially in professional settings. A recent study reported that 82.7% of perimenopausal and postmenopausal women feel stigma related to their symptoms, and over a third report feelings of shame (Dahlgren et al., 2023). This can lead to withdrawal from work and social environments, fueled by fear of being judged or misunderstood. The absence of workplace policies that recognize menopause as a health transition further isolates women, limiting opportunities for support and peer connection.

Design Opportunities:

- Provide informal breakout zones or conversation corners that foster peer connection and normalize discussions around menopause and aging.
- Incorporate messaging and visual cues throughout environments that destigmatize menopause, shifting it from a "private issue" to a shared human transition.

Post-Menopause and Aging

In post-menopause, social wellbeing is often shaped by broader issues of aging. Reduced mobility, loss of a partner, or shifting family roles can increase isolation (Golaszewski et al., 2022). Older women may find themselves excluded from community programming, recreational activities, or healthcare services that are not designed with their needs in mind. Preventive care and health maintenance often receive less attention, leaving women to navigate these challenges alone. Without intentional efforts to foster intergenerational connection and inclusive community engagement, many postmenopausal women lose access to the meaningful social interactions that are vital to wellbeing.

Design Opportunities:

- Integrate visible, dignified signage about preventive health and aging support services to reduce barriers and increase engagement.
- Design flexible-use rooms for workshops, wellness programming, or mentorship circles that invite older women to participate and lead.

Conclusion

This first chapter of our three-part series lays the foundation by diagnosing the root problem: women's health has never been systematically considered in how we design our everyday environments. We examined the sex-based physiological and hormonal differences between male and female bodies—and how these differences evolve across a woman's key life stages, from puberty to post-menopause. These are not surface-level distinctions, but deeply consequential shifts that affect how women move, work, recover, and thrive in space. While this chapter primarily focused on mapping these health needs across the female lifespan, it also recognized how individual factors like race, disability, and neurodiversity intersect with women's lived experiences. This chapter delivers a clear diagnosis: the built environment has failed to meet women where they are—biologically, socially, and systemically.

Using a holistic framework aligned with the World Health Organization's definition of health as "a state of complete physical, mental and social well-being," we mapped the gaps. We found that environments not only ignore these distinctions, but they also often exacerbate inequities. Discomfort, fatigue, and stress become daily obstacles for women in schools, workplaces, and public settings.

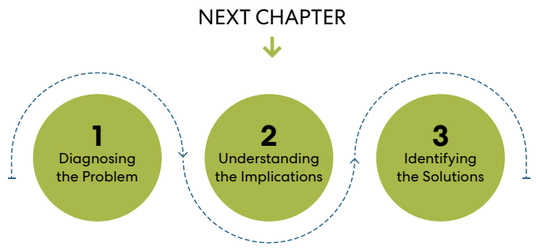
Design is not neutral—it shapes outcomes. It can reinforce disparities or dismantle them, depending on how intentionally we act. Imagine a workplace where a menopausal teacher isn't silently suffering in a poorly ventilated room, where a pregnant educator has space to rest, and where every detail affirms belonging, resilience, and care. These are not luxuries. They are design failures we can no longer afford.

Up next in this series:

Chapter 2: Understanding the Implications

Why women's health in the built environment is not just a social issue—but an economic one with real consequences for workforce retention, productivity, and public health.

NEXT CHAPTER



About PRECEDE

This white paper is a part of PRECEDE, the Public Repository to Engage Community and Enhance Design Equity at Perkins & Will.

PRECEDE equips project teams with evidence-based strategies to design for equity, well-being, and human experience across communities. "Designing for Her" aligns with PRECEDE's mission by addressing the long-standing gaps between women's health and the built environment especially as it relates to schools and workplaces.

PRECEDE helps designers create spaces that dignify and respond to real needs for advancing health outcomes for all.

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