

June 2024



Balance and Aging:

Understanding How Aging
Impacts Decline in Balance

Are Falls the Invisible Epidemic?

Introduction

“Are falls the invisible epidemic?” - Dr. Bob Mirsky, CMO, Nymbi

Falls are the leading cause of injury and accidental death among adults over 65 in the U.S., causing an average of 74 deaths every day.¹

This public health concern has never been sufficiently addressed by traditional methods, as shown by the rising prevalence and cost of falls over the last 20 years - despite prevention efforts.²

As the aging population continues to grow, the prevalence and coinciding cost of falls will continue to rise. Some authors have noted that falls in the U.S. are “taking the shape of an epidemic.”³ We take this notion a step further: falls should be considered and treated as a chronic condition.

Numerous studies have proved that specific factors contribute to falls. But, previous fall prevention strategies have primarily responded to known cases rather than intervening as these known risk factors arise. It's crucial to adopt proactive methods that can prevent moderate-risk fallers from entering the high-to-severe-risk categories and reduce future risk for individuals at lower risk levels.

The following report explores how balance can naturally deteriorate with age and the subsequent increase in risk of falls and associated costs in the United States. At the end, it will discuss how Nymbi's scientifically proven solution is the most effective route to preventing falls and reducing falls cost in the market.

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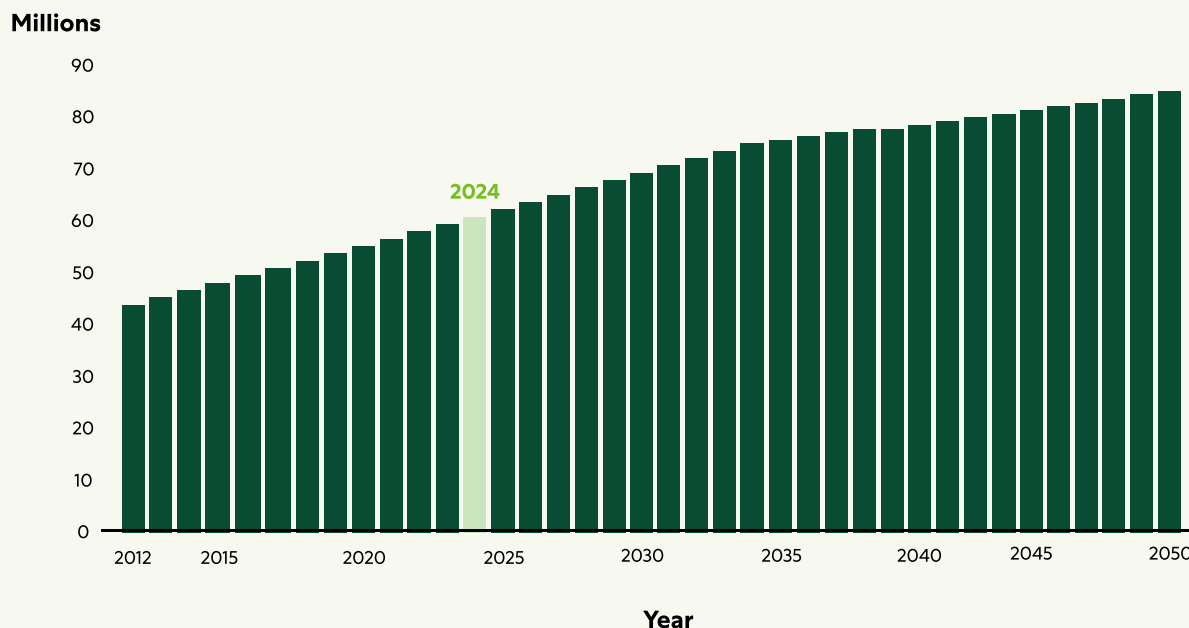
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An Aging Population

While the high incidence of falls among older adults is not new, only recently has it begun to receive widespread attention. The growing population of older adults in the U.S. is increasing the prevalence and resulting cost of falls - demanding more attention and resources from health plans throughout the nation.

The U.S. population is older today than it has ever been, with 58 million adults aged over 65.⁴ This number is predicted to reach 82 million by 2050, as shown in Figure 1 below.⁵

Population Aged 65 and Over in the United States: 2012 to 2050



(Figure 1)

Prevalence of Falls Among Older Adults



Only 1 in every 5 reported falls cause a serious injury, such as fracture or head trauma.⁷ Thus, many non-injurious falls go unreported each year - making falls prevalence difficult to accurately quantify.² These less injurious falls serve as an early indicator that a more severely injurious fall is imminent.

Despite the shortfalls in estimates, available data shows that falls are on the rise.

Using data from the Centers for Medicare & Medicaid Services (CMS), an independent actuarial team created a model to quantify falls prevalence by identifying severe fall-related injuries that were inaccurately coded. The final model identified an average falls prevalence rate of 21%.⁸

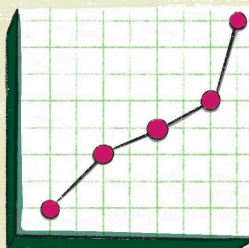
At this prevalence rate - and as the population of older adults continues to grow - there will be 15.75 million older adult falls each year by 2035.⁵



70% of deaths in adults aged over 75 are due to falls.⁸



- Falls are the #1 cause of Emergency Medical Services (EMS) responses for older adults in the U.S.⁸
- 1 in 4 older Americans fall each year.⁷
- 1 in 6 falls require emergency care.⁷



Falls account for 6% of the entire Medicare budget, according to CMS.⁹

Understanding Balance and Fall Risk

The effects of aging on balance is the underlying cause of most falls.

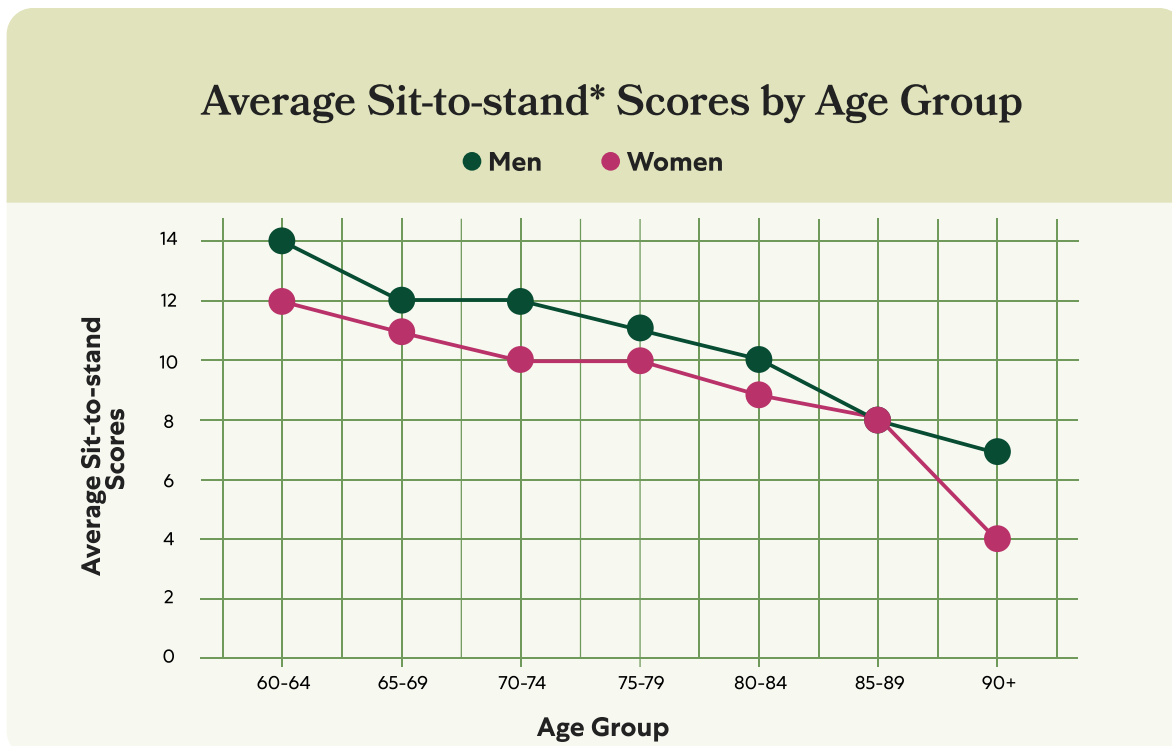
Balance affects everyone as they age. It is a foundation of functional independence, enabling individuals to avoid falls and the resulting decline in health that stems from limited mobility.

When older adults experience declining balance and grow prone to falls, they often limit their daily activities to avoid what they perceive as risky situations. In turn, this avoidance leads to inactivity, further reducing balance and increasing fall risk. Eventually, many older adults may not be able to leave the house, or even perform activities of daily living - signs foretelling a loss of independence.

While many factors can lead to an increased risk of falling, the prevalence of these risk factors rise directly with age.¹¹ Notably, individuals who do not present any risk factors still experience falls.¹²

Balance Declines with Age

Most of us don't realize our balance is declining until we experience a fall. But, the reality is that balance begins to decline far earlier than we realize. As people age, their balance declines, as shown by the balance assessment scores (sit-to-stand) decreasing categorically by age (Figure 2).



(Figure 2)

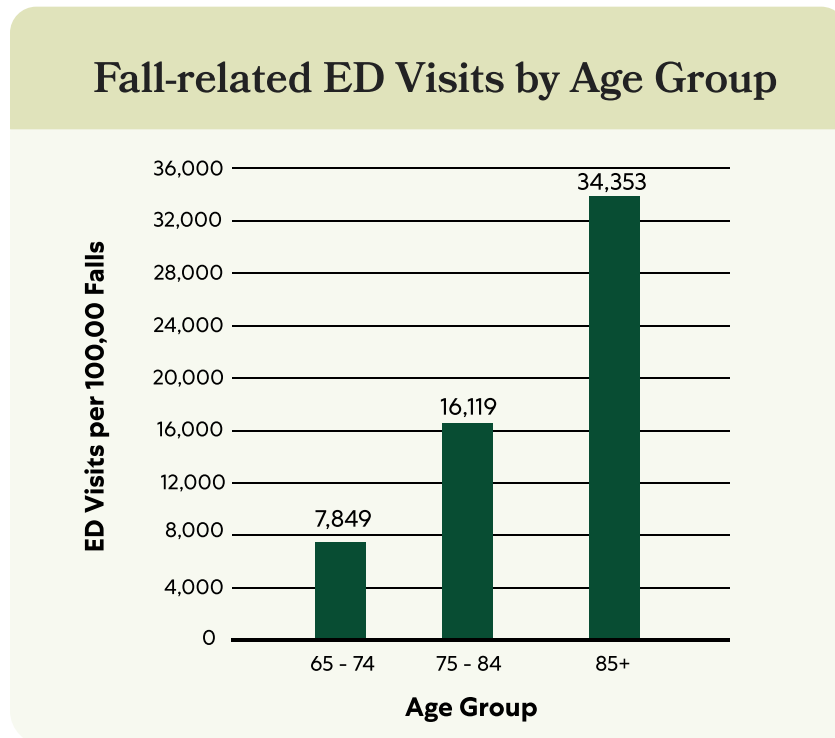
*The CDC recommends the sit-to-stand assessment for assessing lower body strength and balance. It measures how many times an adult can stand up from a seated position without using their arms within 30 seconds. A below average score indicates risk for falls.

The driving factor is the deterioration of our balance reflex - also known as the vestibulo-ocular reflex (VOR).¹³ This innate system relies on sensors in our inner ear, nerves, and brain processing to keep our vision stable and balance intact when we move.¹⁴ All components of the balance reflex are subject to age-related changes that impact the brain's ability to integrate sensory information.¹⁵

In our 30s and 40s, this decline is barely noticeable – sometimes arising as a slight hesitation on uneven ground. However, as we move into our 60s and beyond, the diminished balance reflex makes it difficult to maintain the same balance during daily activities - like walking.¹⁶ At this stage, we begin to experience stumbles, near-falls, and initial falls ranging from non-injurious to injurious.

Once we reach our 70s and 80s (without intervention), the deterioration of the balance reflex is usually fully realized. Simple activities like walking down a hallway or getting dressed become major fall risks.

Due to this natural decline in the balance reflex, falls prevalence rises directly with age. As shown in Figure 3 below, emergency department (ED) visits due to falls rise as individuals grow older - indicating an increase in fall risk and related medical claims as we age.¹⁷ This graph also proves that no age group is immune to falls.



(Figure 3)

While decline in the balance reflex is natural, the balance reflex can be re-trained through dual-tasking (Nymbi's patented approach to balance training that combines body and brain exercises).¹⁸ Retraining the balance reflex changes the trajectory of fallers - making high risk fallers less likely to fall and ensuring lower risk older adults never enter the high risk category to begin with.

Falls - a Chronic Condition?

Falls vs. Known Chronic Conditions

Why aren't falls recognized as a chronic condition?

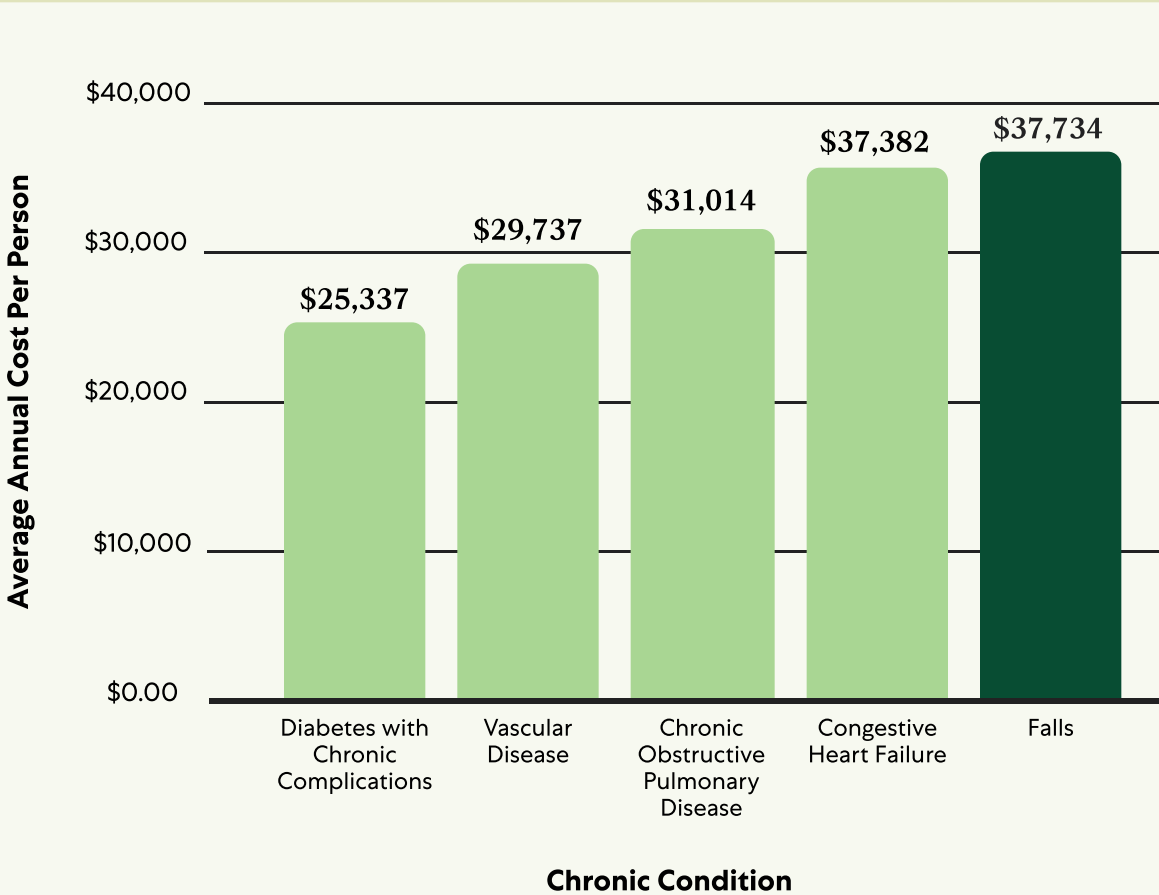
1 in 4 older adults fall each year, and falls cost an average of \$3,144 PMPM.^{7,19} The prevalence and cost of falls is higher than other chronic conditions, and falls meet the CDC's definition for chronic diseases (Figure 4).

Chronic Condition Criteria ²⁰	Falls as a Chronic Condition
"The condition lasts 1 year or more."	Falls last 1 year or more. 71% of first-time fallers experience a second fall within 1 year and are likely to continue falling the next year without intervention. ¹⁹
And the condition satisfies one or both of the following: a. "Requires ongoing medical attention." b. "Limits activities of daily living."	Falls limit activities of daily living. 50% of non-fallers and as much as 92% of fallers have a fear of falling. ⁸ The fear of falling often leads individuals to limit daily activities in attempts to stay safe. ²¹ This promotes inactivity - which only increases fall risk and can result in loss of independence. ²¹

(Figure 4)

Furthermore, analyzing the cost of falls alongside the cost of the most common and expensive chronic conditions facing older adults puts the magnitude of falls into perspective.

Average Cost Per Member Per Year (PMPY) by Chronic Condition



(Figure 5)

As shown in the graph above (Figure 5), the PMPY cost of a fall is greater than the PMPY cost of many common chronic diseases. The annual per member cost of a fall (\$37,734) is almost the same as that of congestive heart failure (\$37,382).^{19,22}

Progression of Falls vs. Heart Failure

Comparing falls to heart failure (a high-cost condition requiring repeated interventions that escalate over time) sheds more light on the significance of falls - and why a population-wide approach is necessary (Figure 6). Once an older adult enters the high risk category for falls, they face a progression similar to that of a high-cost heart failure patient.

Case Study - Progression of Falls vs. Heart Failure

Stage		Heart Failure	Injurious Fall
6 months pre-fall/ heart failure	Indicators	High blood pressure, high cholesterol, diabetes, coronary artery disease (episodic).	Subtle balance issues, near-falls, less-injurious to mildly-injurious falls, gait changes.
	Intervention	Provider recommends lifestyle changes and medication changes - plans may offer health programs.	Intervention is rarely provided at this stage.
	Potential impact	Individuals present other risk factors for heart failure which are often treated.	Increased fear of falling, reduced activity levels, isolation.
12 months post-fall/ heart failure	Indicators	Hospitalization and post-hospitalization period, recurring provider visits. High likelihood of re-hospitalization.	Hospitalization and post-hospitalization period from an injurious fall. High likelihood of re-hospitalization from further falls.
	Intervention	Provider recommends cardiac rehab and lifestyle changes followed by ongoing monitoring.	Provider sometimes recommends rehabilitation and/or fall prevention programs.
	Potential impact	Shortness of breath, fatigue, reduced activity tolerance, risk of re-hospitalization, impact on daily functioning.	Temporary or lasting mobility restrictions, ongoing fear, potential for isolation, impacting quality of life.
Long-term effects post-fall/ heart failure	Indicators	Potential for disease progression, declining quality of life.	Reduced independence, reliance on assistive devices, managed care.
	Intervention	Provider focuses on managing co-existing chronic conditions; end-of-life discussions may begin.	Provider-led management of chronic consequences from falls, possible long-term interventions.
	Potential impact	Quality of life is greatly reduced in advanced stages. Costs decline until patients are re-hospitalized, when full loss of independence occurs. Heart disease is a leading cause of death for older adults.	Falls often lead to lasting reductions in mobility and independence, increasing reliance on healthcare. This decline can necessitate full time care. Fall-related injury is the most common cause of injury death for older adults.

(Figure 6)

The major difference between the two conditions is that early intervention can truly prevent falls and fall-related medical costs - without much upfront cost. Many studies have proven that early intervention can prevent future falls, loss of independence, and fall-related medical costs.²³ While intervention can treat heart failure more effectively when administered early, it does not prevent rising costs of care, loss of independence, and death - it only slows the progression. Balance should be treated like other chronic conditions, with intervention provided to patients as soon as early indicators of the condition arise.

Nymb: Population-wide Fall Prevention for MA Plans

Nymb is a scientifically validated, digital mobility enhancement platform purpose-built to improve balance, reduce fall risk, and ultimately prevent falls in older adults.²⁴ It employs a patented dual-tasking methodology to reverse the age-related loss of the balance reflex – a universal change that contributes to falls among older adults.



Nymb's Impact: Catching Falls Early

- **Targeting the Longitudinal Path of a Faller:** Nymb intervenes on the natural path of a faller - sometimes even before their first 'medically-diagnosed' fall.²⁵ This is crucial, since Fall-related Claim (FRC) spend begins 3-months prior to the fall rather than at the date of the fall incident - a common misconception among MA plans.⁸ Medical spend during the 6-month period before an FRC amounts to 42% of the spend in the 6-months following an FRC, partly because unreported falls often occur prior to the FRC.⁸ This highlights the importance of a population-wide approach to falls prevention for maximum cost savings.
- **Unique Approach:** Nymb is the only solution with proven population-wide impact for MA plans. Competitors primarily target and attempt to impact known, high risk fallers or low risk individuals. Nymb stratifies the member population into risk categories using baseline assessments and monitors progress through subsequent checkpoints using the STEADI. This allows us to provide personalized balance training for all risk levels.

Global Validation & Evidence of Cost Savings

Nymb's efficacy is backed by large-scale studies, including a landmark study of 15,000 participants with New Zealand's national healthcare system (which shares the same falls prevalence rate as the U.S.).²⁶ Key findings include:

- **Significant Reduction in FRC Frequency for Participants.** Users completing 4+ Nymb sessions had a 41% reduction in average quarterly claims.²⁷
- **Nymb Reduces Emergency Department (ED) and Inpatient (IP) Utilization.** A separate study found ED visits decreased by 22.4% and IP admissions by 14.75% per 1,000 members among older adults with a previous fall or fall-related injury.²⁵

Accessibility: Removing Barriers

Nymbl addresses common obstacles faced by older populations seeking falls prevention support:

- **No In-Person Required:** Nymbl eliminates the need for in-person support, such as classes or physical therapy. Many older adults lack reliable transportation, live in rural areas, or experience other access barriers hindering their participation in such programs.
- **Minimal Internet Connectivity:** The solution requires minimal internet connectivity and empowers self-directed training at home, meeting the preference of 90% of older adults who want to train on their own time.²⁸
- **Older Adults Are Tech-Enabled:** Nymbl boasts higher levels of engagement among older adults than other digital solutions because we design our program to fit their needs. It empowers members to take ownership of their health journey, address their pain points rather than those of their care team, and uses encouraging language and education to motivate change.²⁸

Driving Results: Adoption, Engagement, Mobility

Nymbl's impact stems from a focus on measurable outcomes and user experience:

- **Adoption:** 10% adoption rate.²⁸
- **Engagement:** 34% engagement rate (30x better than the national average for fall programs).²⁸
- **Rapid Results:** Users report physical mobility improvement within 30 days, significantly faster than the 6–8 months typical of traditional strength-based approaches.²⁸

Nymbl also helps plans precisely identify and calculate true FRC costs with a validated algorithm, ensuring targeted interventions for maximum cost impact.

Conclusion

“Falls are the invisible epidemic.”

- Dr. Bob Mirsky, CMO, Nymbl

Falls among older adults constitute a growing public health crisis – a crisis that traditional approaches have not adequately addressed. The evidence presented in this report illustrates the direct correlation between the age-related loss of the balance reflex and increased fall risk, solidifying falls as a chronic health condition deserving the same level of attention and resource allocation as other chronic diseases.

Furthermore, the escalation of medical costs before a reported fall-related injury highlights the urgency for proactive, population-wide prevention strategies. Nymbl’s ability to overcome barriers faced by traditional fall prevention models and reduce FRC costs makes it a sustainable fall prevention model for health plans nationwide.

Nymbl is proven to reduce falls and medical spend for high risk fallers. But, its true value lies in the ability to intervene early on - slowing the progression of balance decline to prevent would-be fallers from entering the high risk category.

As the older adult population continues to grow, measures to address fall prevention will be paramount for the well-being of individuals and the sustainability of the healthcare system. Nymbl, with its robust evidence base and focus on accessibility, is poised to become the standard of care for fall prevention, empowering older adults to age gracefully, safely, and independently.

Balance training is for everyone.



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