MILKEN INSTITUTE

A Global Imperative to

Improve Brain Health

Agnes Stephens, Samantha Kost, PhD, Ishita Das, PhD,
Katherine Eyring, PhD, Tanisha London, PhD,
and Sylvie Raver, PhD

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The Milken Institute is a nonprofit, nonpartisan think tank focused on accelerating measurable progress on the path to a meaningful life. With a focus on financial, physical, mental, and environmental health, we bring together the best ideas and innovative resourcing to develop blueprints for tackling some of our most critical global issues through the lens of what's pressing now and what's coming next.

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Milken Institute Strategic Philanthropy advances the strategic deployment of philanthropic capital to create a better, more equitable world. We tackle persistent societal challenges by giving philanthropists insights, tools, and strategies to take big risks and test bold ideas.

About SPARC

The Milken Institute's Science Philanthropy Accelerator for Research and Collaboration (SPARC) works to develop, launch, and lead initiatives that fund medical research and invest to accelerate the development of tools and treatments that will bring better health to millions of people. Our expertise lies within numerous medical research fields, including neuroscience, mental health, oncology, rare diseases, and immunology. We partner with philanthropists, leading them through complex medical research and clinical systems and guiding pathways for philanthropy to create a healthy, equitable world.

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FOREWORD

The Science Philanthropy Accelerator for Research and Collaboration (SPARC) at the Milken Institute is a team of about two dozen. In my sampling of these colleagues, nearly every member has been impacted by a brain disorder. Whether they have firsthand experience with a brain health condition, caretaking for a parent with a neurodegenerative disease, or avoiding an audiologist visit for midlife hearing loss, the team has experiences that often feel deeply personal and isolating. Yet these experiences are nearly universal, and our team's unofficial sampling is not an anomaly. Statistically, brain health conditions will impact eight out of 10 people.

As of 2021, disorders of the nervous system were the leading cause of disease burden worldwide. With populations aging, conditions such as dementia and stroke are expected to remain among the greatest health challenges of our time. Our response to these conditions has been largely reactive, relying on limited treatments and placing immense strain on patients, caregivers, and health systems. Advances in neuroscience, though, indicate that a reactive posture isn't the only approach and that we can adopt a proactive stance, preventing brain disease by promoting brain health.

Science is increasingly hopeful: Many brain diseases are more preventable than once thought. As we deepen our understanding of how these conditions develop, we see clear opportunities to reduce risk and preserve cognitive resilience. In turn, fundamental knowledge of brain function informs the science of brain dysfunction, an area in which health and disease are interconnected through discovery rather than disparate schools of thought.

Brain health is thus emerging as a scientific field and a public health priority, with growing evidence that individuals can meaningfully shape their own outcomes through lifestyle choices and modifications. Healthy behaviors not only reduce disease risk and extend health span but also strengthen what we call the brain economy, driving productivity and societal resilience.

Despite this promise, the lack of focus on brain health is emblematic of the broader challenges in science and health: complex, crosscutting, and impossible to solve in isolation. Our work is grounded in the belief that funders—equipped with knowledge and strong partnerships—can accelerate more rigorous, inclusive progress. With roots in advancing treatments and care for neurodegenerative disease, we have followed the science toward prevention through brain health.

This report, developed in partnership with the Global Brain Care Coalition, illuminates the urgency of and the opportunity for better brain health care. The brain health landscape points to an undeniable need for alignment and awareness, but also to the hope and optimism inherent in disease prevention. With integrated strategies that link prevention with care, science with policy, and innovation with equity, we can build capacity to respond responsibly to this moment. Above all, this report calls for brain health to be recognized as foundational to economic resilience, social well-being, and human dignity.

Cara Altimus, PhD
Managing Director, SPARC, Milken Institute

EXECUTIVE SUMMARY

Around the world, brain health is increasingly recognized as an essential component of disease prevention and, beyond that, as a cornerstone of cognitive vitality, mental well-being, and quality of life across the lifespan. Brain health is achievable through sustained, proactive action by individuals, communities, and policymakers. Yet, age-related neurological and psychiatric diseases, including dementia, stroke, and late-life depression (LLD), remain major and growing public health challenges.

As the global population over age 60 is expected to double by 2050, the prevalence of age-related brain disease will surge: Dementia cases are projected to nearly triple to 152.8 million, stroke deaths will rise by more than 50 percent, and the number of people living with LLD will grow to nearly 100 million. Marginalized populations are disproportionately impacted, facing higher risks and limited access to essential preventive and care services. Without systemic interventions, the combined global economic burden of dementia, stroke, and LLD is expected to exceed $5 trillion annually by midcentury, alongside a sharp rise in disability-adjusted life years (DALYs) lost to these conditions.

However, the trajectory of brain diseases is not inevitable. Strong epidemiological evidence shows that up to 45 percent of dementia cases, 80 percent of DALYs lost to stroke, and 21 percent of major depression is linked to *modifiable* risk factors. In response, stakeholders across sectors, including major intergovernmental organizations like the World Health Organization (WHO) and United Nations, are increasingly taking action by embedding brain health into their global aging, public health, research, and clinical health-care initiatives. These efforts are repositioning brain health as a fundamental pillar of lifelong wellness, social resilience, and economic sustainability.

From 2024 to 2025, the Milken Institute SPARC, in partnership with the Global Brain Care Coalition, conducted a strategic analysis to understand the opportunities in the brain health ecosystem. Our findings show that advancing brain health will require sustained leadership and coordination across public, private, and civil society sectors, particularly to strengthen primary care infrastructure, expand access to preventive services, address systemic inequities, and foster inclusive, age-friendly environments. This report presents our findings and a call to action to join a growing global brain health ecosystem working to build a future in which brain health is prioritized for everyone, everywhere.

INTRODUCTION

Around the world, individuals, communities, organizations, and governments are elevating brain health as a priority—not only to reduce disease burden, but to promote cognitive vitality, mental well-being, and quality of life across the lifespan. This shift has been accelerated by the COVID-19 pandemic's impact on mental health, the rising costs of age-related brain diseases like dementia and stroke, and a growing body of evidence showing that lifestyle and environmental factors profoundly influence brain outcomes. Alongside traditional medical approaches, a burgeoning wellness industry now targets brain-healthy behaviors, while emerging technologies—such as artificial intelligence (AI), telehealth, and neurotechnology—offer promising new avenues for prevention and early intervention. The question facing the global community today is not only how to treat brain diseases, but how to foster brain health from early life through old age.

The Global Challenge of Age-Related Brain Diseases

Brain diseases, both neurological and psychiatric, collectively affect over 3 billion individuals globally, accounting for more than one-third of the world's population. These conditions are the leading cause of illness and disability worldwide, with their overall burden increasing by 15 percent since 1990. Neurological disorders such as Parkinson's disease, multiple sclerosis, stroke, and migraines constitute the second-leading cause of death globally. As the world's population ages, this burden is expected to grow even further, with aging populations particularly vulnerable to conditions like dementia, stroke, and depressive illnesses (e.g., LLD).

In addition to the strong prevalence of these conditions on their own, they also exhibit high rates of comorbidity. Clinically, the diagnoses of LLD and dementia can be difficult to disentangle. For example, a study of a subset of participants within the storied 75-plus-year-old Framingham Heart Study demonstrated that those with a history of depression had a 50 percent higher risk of developing dementia over a 17-year period. Depression is also a risk factor for stroke, with depressed individuals facing a 41 percent increased risk of stroke and a 39 percent higher risk of stroke-related death compared to those without depression.

Crucially, each of these conditions is preventable to some degree. According to the American Heart Association (AHA) and American Stroke Association, an estimated 60–80 percent of strokes could be prevented through diet, lifestyle, and other modifications. A standing *Lancet* Commission on dementia prevention, intervention, and care recently reported that

SPOTLIGHT ON STROKE, DEMENTIA, AND DEPRESSION

Stroke is a leading global cause of disability and mortality, contributing to significant economic and societal costs.

Dementia is now one of the top causes of disability and dependency among older adults, with a steep cost of $1 trillion annually for care. WHO estimates that by 2050, the global number of people living with dementia will triple to over 150 million.

Depression is projected to become a leading cause of disability worldwide by 2030. LLD, which affects adults 60 and over, is underdiagnosed and undertreated. Suicide rates are highest in older individuals (75-plus), compared to other age groups, particularly non-Hispanic White men.

45 percent of dementia cases could be prevented by fully addressing 14 lifestyle factors. Additionally, meta-analyses suggest that 22–38 percent of major depressive episodes can be prevented.

When properly diagnosed and treated, more than 70 percent of those suffering from depression recover and return to their normal lives.

Brain Health as a Lifelong Priority

The world is responding to the growing global burden of neurological and psychiatric disorders through an increasing emphasis on brain health. WHO defines brain health as the promotion of optimal brain development, cognition, and well-being across the life course, emphasizing the continuous nature of brain health rather than seeing it as a fixed state. WHO's perspective emphasizes factors that influence brain health, such as genetics, environmental exposures, and lifestyle choices, which interact in multidimensional ways.

Some risk factors, like genetics and age, are non-modifiable, but many lifestyle factors, including diet, exercise, and mental stimulation, are under more control. Key risk factors for brain disease—hypertension, diabetes, smoking, and sedentary lifestyles—provide actionable targets for public health interventions, suggesting that prevention efforts focused on these modifiable factors could reduce the incidence of brain disorders on a global scale.

Stroke, dementia, and depression are among the age-related brain diseases with the highest prevalence and incidence worldwide, but each has a high degree of preventability through diet, lifestyle, and other modifications.

As brain health rises on the global agenda, efforts to support brain and mental wellness and well-being extend beyond traditional health-care systems. A growing wellness movement promotes physical activity, nutrition, sleep, mindfulness, and cognitive engagement as essential pillars of brain care, while private-sector interest in **brain capital**—the cognitive and emotional resources that fuel economic growth and innovation—is driving new workplace strategies to support mental well-being and resilience. Strengthening brain health has become not only a medical necessity but an economic and social priority across sectors.

There are several challenges to improving global adoption of brain-healthy practices. These primarily relate to low public awareness and engagement, lack of distinction between disease progression and normal aging, health disparities, and social determinants of health (SDOH). Compared with other risk-modifiable conditions, such as cancer or heart disease, brain disorders often have a lower level of public awareness and prioritization when promoting healthy behaviors for prevention or early identification.

In turn, this affects policy focus and resource allocation. Furthermore, stigma and fear surrounding brain health issues, particularly dementia, further complicate efforts to engage the public in proactive health measures.

Although many people worry about age-related changes to their brains or fear future changes, a national poll on healthy aging reports that the vast majority of US adults do not talk to their physicians about these concerns. Brain health, conceptually, has population-level recognition, but there is a significant gap in communication between patients and health-care providers, health literacy, and resource allocation that contributes to the high burden of brain disease.

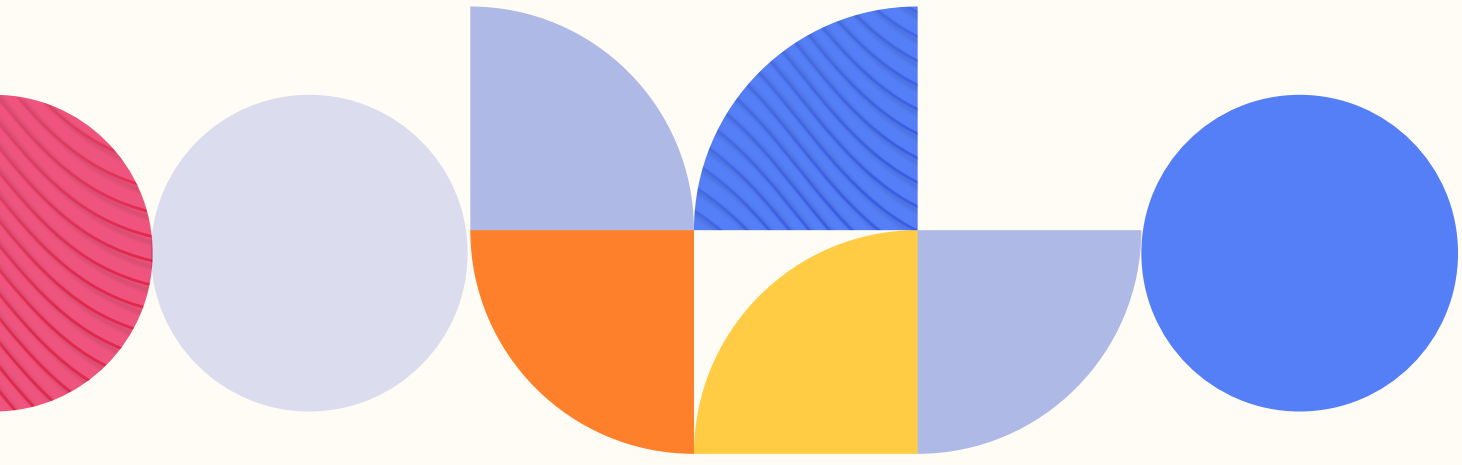
Brain care, a new concept in brain health, emphasizes a holistic, preventive approach that integrates societal support, health literacy, and early interventions to manage and reduce the risk of brain-related conditions. Rather than aiming for peak brain performance, brain care promotes evidence-based practices (e.g., physical activity, blood pressure control) and prioritizes their integration across health systems and public health initiatives. Advancing brain care requires raising awareness of brain health risks, embedding brain care into health frameworks, addressing disparities in access, and fostering inclusive, age-friendly communities. By focusing on prevention and equity, brain care supports healthier brains and longer, healthier lives.

EPIDEMIOLOGY AND THE GLOBAL BURDEN OF BRAIN DISEASES

Broadly, brain diseases are routinely grouped into two categories: neurological disorders and psychiatric disorders. Neurological disorders, which involve damage or dysfunction in the nervous system, often manifest with physical symptoms like movement difficulties or memory loss, while psychiatric disorders are characterized by changes in mood, thought processes, or behavior.

However, these are primarily medical diagnostic distinctions; biologically and epidemiologically, there is significant overlap between these brain conditions. Neurological disorders can lead to psychiatric symptoms and vice versa. **This complex relationship highlights the importance of a comprehensive approach to understanding, diagnosing, and addressing both the neurological and psychiatric aspects of brain health.**

Brain disease—be it neurological or psychiatric—poses a significant and growing challenge to global public health, profoundly impacting individuals and societies worldwide. In a survey of US adults, more than 80 percent identify as having a firsthand or secondhand experience with a brain health condition. Aging is considered the most significant risk factor for most neurological disorders, and as communities age, the number of people affected by age-related brain diseases will rise concomitantly.



The rising prevalence of brain diseases poses an untenable future for the global community and the health-care industry. Additionally, failure to treat these diseases within numerous cultural contexts hinders the development of effective, culturally relevant global brain health strategies. Understanding the epidemiology, underlying disparities, and accumulated societal cost of the conditions is crucial to reducing their prevalence.

TABLE 1: EPIDEMIOLOGY AND ECONOMIC BURDEN OF AGE-RELATED BRAIN DISEASES

	Current US Prevalence (2025)	Projected US Prevalence (2050)	Global Prevalence	Economic Burden (Annual)
Dementia	7+ million	13+ million (estimated from global growth)	150+ million by 2050	$1.3 trillion globally (2024) $2.8 trillion by 2030 $405,000/ person (US)
Stroke	9.4 million people have had a stroke 795,000 strokes occur/year (25% recurrent)	20 million 50% increase in stroke deaths by 2050	101 million prevalent cases	$891 billion globally $67 billion (US, 2019–2020)
Depression	43 million (8.7% of older adults)	46+ million	280+ million people Nearly 100 million cases of LLD globally by 2050	$326 billion (US) $1 trillion globally*

*Cost attributed to depression and anxiety

Sources: Alzheimer's Association (2025), Centers for Disease Control and Prevention (2025), WHO (2025), WHO (2021), Chisholm et al. (2016), Feigin et al. (2023), GBD 2019 Dementia Forecasting Collaborators (2022), GBD 2019 Stroke Collaborators (2021), Greenberg et al. (2021), Heo et al. (2008), Joynt Maddox et al. (2024), Kazi et al. (2024), Tsao et al. (2023), Wang et al. (2025)

Epidemiology and Prevalence

DEMENTIA

Dementia is a progressive neurological condition marked by declining cognitive abilities, such as memory, thinking, and decision-making. Alzheimer's disease (AD), the most common form, is linked to abnormal protein buildup in the brain that disrupts neuron communication and causes cell death. Vascular dementia, the second-most-common type, results from reduced blood flow and vessel damage in the brain, often due to strokes or chronic vascular disease. Both types are worsened by neuroinflammation and oxidative stress.

In the US, over 7 million people are estimated to live with dementia, as shown in **Table 1**. Data are limited, though, especially for less recognized forms like frontotemporal dementia, which may be underdiagnosed. Current US prevalance estimates indicate that AD is the most common (43.5 percent), followed by vascular dementia (14.5 percent), Lewy body dementia (5.4 percent), and frontotemporal dementia (1 percent). However, these figures may be inaccurate due to methodological limitations, including small sample sizes; outdated diagnostic criteria; inconsistencies in documenting dementia across the health-care system; self-reported data; and limited racial, ethnic, and socioeconomic diversity, which may lead data to inaccurately reflect the true prevalence and impact of the disease across diverse populations.

Dementia risk increases with age and is influenced by factors like poor cardiovascular health, inactivity, inadequate sleep, and unhealthy habits. According to the 2022 National Health Interview Survey, dementia diagnoses rise from 1.7 percent in ages 65–74 to 13.1 percent in those 85 and older. AD can begin decades before symptoms emerge, with changes detectable in midlife.

Women are disproportionately affected, making up nearly 60 percent of AD cases and facing higher lifetime risk. Though longer life expectancy in women partly explains this, emerging evidence suggests biological factors—like the drop in estrogen during menopause and its impact on brain pathology—may also contribute.

STROKE

Stroke is a major global cause of death and disability. Strokes result from disrupted blood flow to the brain. They are primarily classified as ischemic stroke (caused by blockages—these account for 87 percent of cases) and hemorrhagic stroke (caused by ruptured blood vessels and associated with higher mortality). Transient ischemic attacks, or "mini-strokes," are temporary and less severe but still affect around 240,000 Americans annually.

In the US, about 795,000 strokes occur each year, with 25 percent being recurrent. Stroke is the leading contributor to DALYs among neurological disorders, with long-term effects often requiring extensive rehabilitation. Stroke disproportionately affects communities of color and people with lower socioeconomic status, largely due to higher rates of hypertension, a key risk factor.

From 2011 to 2022, stroke prevalence in the US increased by 7.8 percent, with the highest rises among American Indian, Native Hawaiian, Pacific Islander, and Black adults. These trends highlight the urgent need for preventive strategies, equitable care, and global coordination to reduce the growing impact of stroke on public health.

DEPRESSION

Depression is a common and disabling mental health condition marked by persistent low mood, loss of interest, and impaired daily functioning. Affecting over 280 million people globally, it is the most prevalent mental health disorder and a leading cause of disability. Its biological complexity—linked to neurotransmitter imbalances, dysfunction of the brain and body's stress response, neuroinflammation, and reduced neuroplasticity—makes it difficult to treat. Emerging research also links depression to an increased risk of dementia, due to its role in triggering brain blood vessel damage and cognitive decline.

In the US, depression is more common among women and individuals with chronic medical conditions. Older adults are particularly vulnerable due to age-related health issues, reduced mobility, chronic pain, and social isolation. Globally, the average expected prevalence for depression in older adults is 32 percent, with nearly 27 percent of global suicide deaths occurring in this age group. LLD, which can occur for the first time

after age 60, often coexists with dementia or stroke and is linked to cognitive decline, including memory loss and reduced executive functioning. Despite its prevalence, depression in older adults is not a normal part of aging and warrants proper attention and care.

Health Inequities

Disparities in the diagnosis, treatment, and care of neurological and psychiatric conditions are rooted in systemic inequities tied to race, socioeconomic status, and access to care, commonly referred to as SDOH. In the US, these inequities are stark. For example, life expectancy ranges from 73.1 years for American Indians/Alaska Natives to 85.7 years for Asian Americans. Communities of color and those with lower incomes often face greater exposure to environmental stressors, food insecurity, and limited access to quality health care, all of which worsen brain health and increase the risk of dementia, stroke, and LLD.

In dementia care, US Black and Hispanic older adults are less likely to receive early diagnoses and often face barriers to accessing specialized care. Hispanic adults, on average, receive a dementia diagnosis one full year longer after onset than non-Hispanic adults. These inequities are compounded by mistrust of the medical system, provider bias, and lack of culturally competent services. While early diagnosis and intervention can improve outcomes, disparities in health literacy and insurance coverage further limit access for many Americans.

Stroke outcomes also vary significantly by race and socioeconomic status in the US. For example, Black Americans are nearly twice as likely to experience a first stroke and have higher stroke mortality rates compared to White Americans. Poor hypertension control, limited access to preventive care, and systemic racism in health care contribute to these outcomes. Meanwhile, low-income communities are more likely to lack emergency services and rehabilitation programs, which are critical for stroke recovery.

Mental health inequities are similarly pronounced. Depression is underdiagnosed and undertreated in many US populations, particularly among Hispanic and Black adults, due to stigma, limited mental health coverage, and lack of linguistically and culturally appropriate care. Older adults in marginalized communities often experience higher rates of isolation and emotional distress, further exacerbating mental health challenges. Culturally responsive models, like community-based peer support or integrated care in primary settings, show promise in bridging these gaps.

Globally, these inequities are even more pronounced, especially in low- and middle-income countries (LMICs), where nearly 60 percent of people living with dementia reside and access to stroke and mental health care is limited. Innovative programs like Zimbabwe's Friendship Bench, through which lay health workers provide talk therapy, offer models that could inform equitable care approaches in the US as well.

Ultimately, inequities in brain health reflect broader structural inequities. Addressing them—and preventing existing gaps from widening further—requires investment in community-based care, expanded access to preventive services, culturally competent support, and systemic reforms focused on eliminating bias and improving health equity in the US and worldwide.

Cost to Societies

In the US, the percentage of adults 65 and older grew from 13 percent in 2010 to 16.8 percent in 2020, with projections reaching 21 percent by 2030. Older adults typically incur higher health-care costs, so this demographic shift is expected to place increasing pressure on an already strained health-care system.

Neurological and psychiatric conditions contribute significantly to this burden, as they carry enormous direct (e.g., medical care, long-term services) and indirect (e.g., unpaid caregiving, productivity loss) costs. In 2017, the total annual economic impact of neurological diseases in the US was estimated at $800 billion. The cost of stroke alone is projected to exceed $2 trillion by 2050, disproportionately affecting vulnerable populations. Beyond the emotional hardship and reduced quality of life inherent in age-related brain disease, the economic loss, especially as populations in many countries age, poses a serious threat.

Dementia is among the costliest conditions. The annual global cost of dementia surpassed $1.3 trillion in 2024 and is expected to rise to $2.8 trillion by 2030, driven by rising prevalence and care demands. In the US, the average annual cost per person with AD was $71,303 in 2010, with approximately $30,000 representing unpaid care. This cost is almost three times higher than for peers without AD.

In high-income countries, long-term care contributes significantly to health-care costs, while in LMICs, the burden falls more directly on families, leading to financial and emotional strain. Delayed diagnosis further inflates costs due to elevated late-stage care needs.

Global stroke costs exceed $891 billion annually. In the US, stroke-related costs reached over $56 billion between 2019 and 2020, largely due to high rates of hospitalization, long-term disability, and the cost of post-stroke care. Inequities in access to acute care and rehabilitation—especially in low-income and rural communities—worsen outcomes and increase both individual and societal costs. Strengthening prevention, emergency response, and recovery services can help reduce these burdens.

Depression costs the US economy over $200 billion annually and, with anxiety, the global economy over $1 trillion annually, largely due to lost productivity, absenteeism, and disability. It is the leading cause of disability in the US.

Many Americans—especially those in marginalized communities—struggle to access timely and culturally competent mental health services, leading to untreated or undertreated conditions and escalating long-term costs. Expanding mental health coverage, improving diagnostic tools, and investing in community-based interventions are key to reducing both human and financial costs. In LMICs, access to mental health services is severely limited by provider shortages, stigma, and a lack of culturally attuned diagnostics. For these communities, cross-cultural adoption of diagnostic tools, community-based care expansion, and clinical workforce development are critical to improving early detection and treatment while reducing long-term societal costs.

Addressing these substantial and growing challenges requires focused national strategies and strong international collaboration that emphasizes early detection, equitable access to care, and sustained investment in both clinical and community-based solutions.

Limitations of Treatments for Age-Related Brain Disease

Treatment options for dementia, stroke, and LLD vary in effectiveness and are often limited, particularly in low-resource settings. While advancing our understanding of biological disease mechanisms is critical, socioeconomic inequity, geographic barriers, and cultural stigma further hinder access to care and early intervention. Typical health-care settings are not designed to introduce treatment for neurological or psychiatric illness until the disease stage is acute or has progressed. Consequently, prevention through modifiable risk factors—like a healthy diet, physical activity, stress management, and blood pressure control—remains one of the most effective strategies for reducing disease burden.

This summary of current treatments and their limitations for dementia, stroke, and LLD, as examples of age-related brain disease, highlights areas of progress as well as ongoing challenges in care delivery.

DEMENTIA

While treatment options are available for dementia, none are curative, and most offer only modest symptom relief. FDA-approved medications for AD, such as cholinesterase inhibitors, may slow cognitive decline in the early or middle stages, but they do not halt disease progression. Emerging antibody-based therapies offer some hope for slowing decline but remain costly and carry safety risks. Diagnostic advances—such as improved amyloid beta, tau, and neurofilament light blood tests, biomarkers, and imaging techniques—are improving early detection, but therapeutic breakthroughs that significantly change outcomes are still lacking. These realities reinforce the importance of preventing disease onset whenever possible.

STROKE

Stroke care has seen substantial advancements in emergency interventions, especially for ischemic strokes, where prompt procedures can restore blood flow and improve outcomes. Ischemic stroke treatment typically involves an emergency procedure to open blocked arteries and restore blood flow to the brain (e.g., thrombectomy, angioplasty, stenting, or clot-dissolving medicines like tissue plasminogen activator), while a hemorrhagic stroke can be treated with a blood transfusion or aneurysm clipping. However, these treatments must be administered quickly—often within hours—and access remains uneven, particularly in rural or low-resource settings.

Long-term stroke rehabilitation is essential but often inaccessible due to high costs or workforce shortages. It increasingly incorporates innovations like neurostimulation and virtual and augmented reality to support recovery. However, the efficacy of these therapies depends on early intervention and extensive follow-up, which can be difficult to access due to geographic limitations and high costs.

Secondary prevention focuses on managing blood pressure and cardiovascular risk. This underlines how the stroke care system is still largely reactive, stepping in only when brain damage is already done.

DEPRESSION

Depression is the most treatable of the three conditions, yet care remains inconsistent and inadequate. Many patients benefit from antidepressants and psychotherapy, though finding the right combination often requires trial and error. Innovations like pharmacogenomics and brain stimulation are helping personalize treatment, and digital tools have expanded access, particularly through teletherapy. Still, significant gaps remain—especially for older adults or underserved populations.

Promising new therapies, including psychedelic-assisted treatments, are in clinical trials but are far from standard. These limitations make prevention—through lifestyle support, early screening, and community-based care—a far more scalable and sustainable solution than waiting for advanced disease to take hold.

COMORBIDITIES

Neurological and psychiatric disorders frequently co-occur, with each influencing the onset and severity of the other. For instance, stroke increases the risk of vascular dementia due to brain vessel damage, while both stroke and dementia contribute to cognitive decline, loss of independence, and emotional distress. Depression then affects up to 40 percent of individuals with AD and more than 30 percent of stroke survivors. This overlap highlights the need for integrated care that addresses both neurological and mental health.

BRAIN CARE FOR THE PREVENTION OF AGE-RELATED BRAIN DISEASES

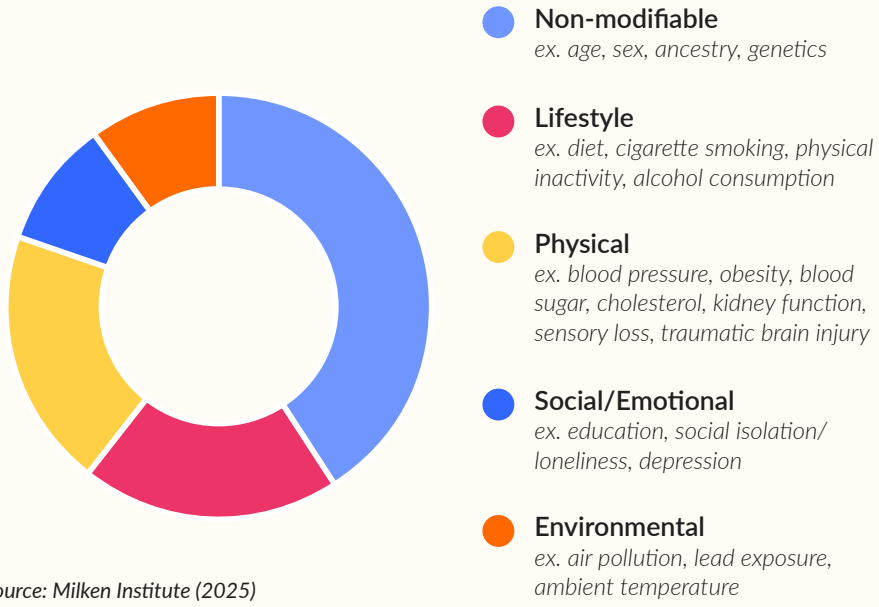
With limited treatment options to mitigate the growing global burden of age-related brain diseases, modifiable factors that can delay or prevent disease onset, or alter disease progression, are effective levers through which individuals and communities can reduce risk. Growing epidemiological research and investment in identifying and characterizing evidence-based modifiable factors underscore their importance and potential for impactful shifts in brain disease. These factors, which are relevant across the lifespan, can be addressed at the individual and policy levels and have the potential to prevent disease at scale. In the following pages, we review evidence-based modifiable factors for dementia, stroke, and LLD.

Modifiable Risk Factors for Brain Disease Prevention

The connection between modifiable risk factors and brain diseases like dementia, stroke, and depression is increasingly recognized by both health-care providers and the public. **The growing body of scientific evidence continues to confirm, reaffirm, and expand the identification of modifiable risk factors that, when addressed, reduce instances of age-related brain diseases.** Primary care providers play a key role in helping patients understand and manage these risks through early communication that encourages and enables patients' behavioral change. Examples of non-modifiable and modifiable risk factors for dementia, stroke, and LLD are shown in **Figure 1**.

Non-modifiable risk factors—e.g., age, sex, race, family history, and certain genetic conditions—can increase vulnerability to brain disease. However, many brain diseases are influenced by **modifiable risk factors**, including physical inactivity, poor diet, smoking, inadequate sleep, unmanaged blood pressure or blood sugar, and limited social engagement. While the definition of "modifiable" suggests an individualistic responsibility for behavior, SDOH, environment, and public health atmosphere strongly contribute to these factors.

FIGURE 1: NON-MODIFIABLE AND MODIFIABLE RISK FACTORS FOR BRAIN DISEASE PREVENTION



Source: Milken Institute (2025)

Regardless, studies show that addressing these and other risk factors can significantly reduce the risk of age-related brain disease, with up to 45 percent of dementia, 80 percent of stroke, and 21 percent of depression cases being preventable. For some, addressing these risk factors may involve managing co-occurring conditions like diabetes and obesity.

Lifestyle-based interventions offer added neuroprotective benefits and include practices like physical exercise, stress reduction, sleep hygiene, anti-inflammatory diets, and mind-body activities like meditation and yoga. However, access to such resources, exposure to brain-healthy settings, and constraints on lifestyle choices remain inequitable, especially in low-income and rural areas.

Integrating brain health into routine health assessments holds promise, especially when clinicians embed it into existing conversations about factors such as diet and exercise. Even in the absence of disease, clinicians need reliable, routine methods to objectively monitor brain health, using individuals as their own baselines over time. Moreover, the evolving nature of research on modifiable risk factors requires assessment tools be regularly updated to reflect the latest evidence. These metrics should be framed as dynamic, actionable goals rather than fixed diagnostic categories to support personalized, preventive care.

Scientific Evidence Supporting Brain Disease Prevention

Although neuroscience has experienced rapid advancement in the past 25 years, much remains unknown about how biological dysfunction contributes to brain disease. Acting on modifiable factors may influence risk by reducing neuropathology or increasing cognitive resilience. Many modifiable factors also relate to one another; for example, obesity is a major risk factor for hypertension.

Epidemiological studies have provided mounting evidence for the modifiable risk factors described here. Ongoing research at molecular, cellular, and systems levels seeks to identify the underlying biological mechanisms.

TABLE 2: SUMMARY OF OVERLAPPING EVIDENCE-BASED MODIFIABLE RISK FACTORS FOR DEMENTIA, STROKE, AND LLD

	Stroke	Dementia	LLD
Physical inactivity	●	●	●
High body mass index, obesity	●	●	
High fasting plasma glucose (diabetes)	●	●	
High systolic blood pressure (hypertension)	●	●	
High LDL cholesterol	●	●	
Cigarette smoking	●	●	●
Diet (high in sodium/red meat; low in vegetables, fruit, and whole grains; excessive alcohol consumption)	●	●	
Environment (high PM 2.5 air pollution, household pollution from solid fuels, low and high ambient temperature)	●	●	
Sensory loss (hearing and vision loss)		●	●
Traumatic brain injury	●	●	
Social isolation or loneliness		●	●

Sources: GBD 2019 Stroke Collaborators (2021), Herrman et al. (2022), Livingston et al. (2024), Rutherford et al. (2017), Turner et al. (2021)

DEMENTIA

A landmark commission, convened in 2017, identified nine factors that, if altered, could prevent a significant proportion of dementia cases. Since its initial publication, this list has been updated twice and currently identifies 14 modifiable risk factors that, if addressed, could prevent up to 45 percent of dementia cases (subset in **Table 2**).

Multiple lines of evidence highlight the potential impact of modifiable factors in reducing dementia risk. In some high-income countries in Europe and North America, the incidence of dementia has actually decreased. While these trends highlight important inequities in access to preventive measures, they also support the idea that prevention is possible.

Furthermore, while most adults 80 and older have some type of neuropathology associated with neurodegenerative disease (e.g., tau or amyloid protein deposits), many do not develop dementia. Modifiable factors may contribute to brain resilience in these individuals, and mechanisms underlying resilience to neurodegenerative disease and cognitive decline are areas of active scientific inquiry.

The relationship between neuropathology and brain disease may manifest differently across individuals due to variation in cognitive reserve. Multi-domain interventions, which target multiple factors at once, have shown significant promise in reducing cognitive decline in randomized clinical trials, notably in the Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) study and its US-based counterpart, the POINTER study. Multi-domain interventions demonstrate efficacy even in individuals with elevated genetic risk for dementia.

Evidence for additional modifiable factors for dementia continues to accumulate, expanding the preventive potential of brain care. While acting on factors described here offers scalable and accessible mechanisms to reduce dementia risk, it simultaneously reduces risk for other health challenges, including stroke and other cardiovascular disease.

STROKE

Nineteen modifiable factors have been implicated in stroke risk. First among them is high systolic blood pressure, or hypertension. The remaining factors constitute a range of environmental, dietary, and physiological factors (subset in **Table 2**).

Stroke is highly preventable, and over 90 percent of the population attributable risk can be attributed to just 10 modifiable factors. Despite the increasing absolute burden, global stroke incidence is decreasing, reinforcing the potential impact of brain care. Modifiable factors for stroke risk are widely accepted, but the incorporation of different prevention strategies within health-care systems varies significantly among countries. Even within a US cohort, the awareness, recognition, and behavioral response to modifiable risk factors for dementia and stroke differ significantly based on age, education level, and the experience of a loved one with dementia, among other factors.

LATE-LIFE DEPRESSION

Emerging research suggests that cigarette smoking and physical inactivity are modifiable factors associated with depressive disorders. Loneliness and having a limited education or small social network in late life is also associated with increased risk. Across the lifespan, preventive psychological treatment provided in schools; during primary, prenatal, and perinatal care; and at work can significantly reduce the incidence of depression.

Promising studies of older participants emphasize the impact that modifiable risk factors have on older adults. In a small, pragmatic, randomized clinical trial (based in the Netherlands), the cumulative incidence of depression was reduced and sustained in participants who were over 75 through cognitive behavioral therapy interventions. Preventive treatment of older adults was also effective in reducing the incidence and symptoms of depression in a trial of older adults in Goa, India. Significantly, this study demonstrated that effective treatment could be provided by lay counselors, an important consideration given the treatment gaps and mental health workforce shortages in some communities.

A COLLECTIVE SCIENTIFIC BASIS FOR PREVENTION

Modifiable factors and health outcomes are highly interrelated, supporting the broad conceptualization of brain health as a keystone component of overall health. Many modifiable risk factors (e.g., physical inactivity) are common to multiple health outcomes (including dementia, stroke, and LLD); interventions targeted to these shared risk factors can broadly improve brain health and resilience. Depression has been associated with hypertension, the leading modifiable risk factor for stroke. Stroke, itself, increases the risk of dementia and depression.

The relationship between depression and dementia is bidirectional. Depression throughout life, and LLD specifically, increases risk for dementia, although pharmacotherapy, psychotherapy, or combined therapy can ameliorate this risk. LLD may reflect prodromal dementia, contribute to dementia risk, or be a consequence of dementia.

The neuroscientific and psychological research supports prevention by addressing modifiable risk factors, both in basic theory and direct application. Evidence supports multiple risk factors that, if acted on, can significantly and broadly improve brain health and mitigate the risk of age-related disease.

However, prevention efforts must be tailored to communities and individuals. Disease incidence, disease prevalence, and the relative contributions of different modifiable risk factors vary significantly across populations, geographic regions, and resources and within community demographics such as age. While prevention efforts can and should be focused on individuals at high risk, population-level efforts are also warranted.

Clearing Up Common Misconceptions About Brain Health

Despite growing evidence, misconceptions about brain health remain widespread. Many people still believe cognitive decline is an inevitable part of aging or that nothing can be done to prevent dementia or stroke. In reality, a substantial body of research shows that lifestyle and health behaviors can significantly influence brain aging and that early interventions can delay or even prevent disease onset. Recognizing and correcting these misconceptions is critical to empowering individuals and communities to prioritize preventive brain care at every stage of life.

Changing the Paradigm: Shifting from Reactive to Preventive Care

Historically, health care has largely focused on treating symptoms of established diseases rather than preventing them. This paradigm began to shift over the past 30 years as advances in the understanding of pathophysiology offered new opportunities for disease prevention and intervention. Additionally, as chronic, noncommunicable conditions like heart disease, cancer, and brain disorders have become leading causes of death in the US, prevention and early detection have gained greater attention, especially in high-risk communities. This shift has blurred the lines between clinical care and public health, encouraging new investments in community-based strategies to address social and environmental factors that shape health outcomes.

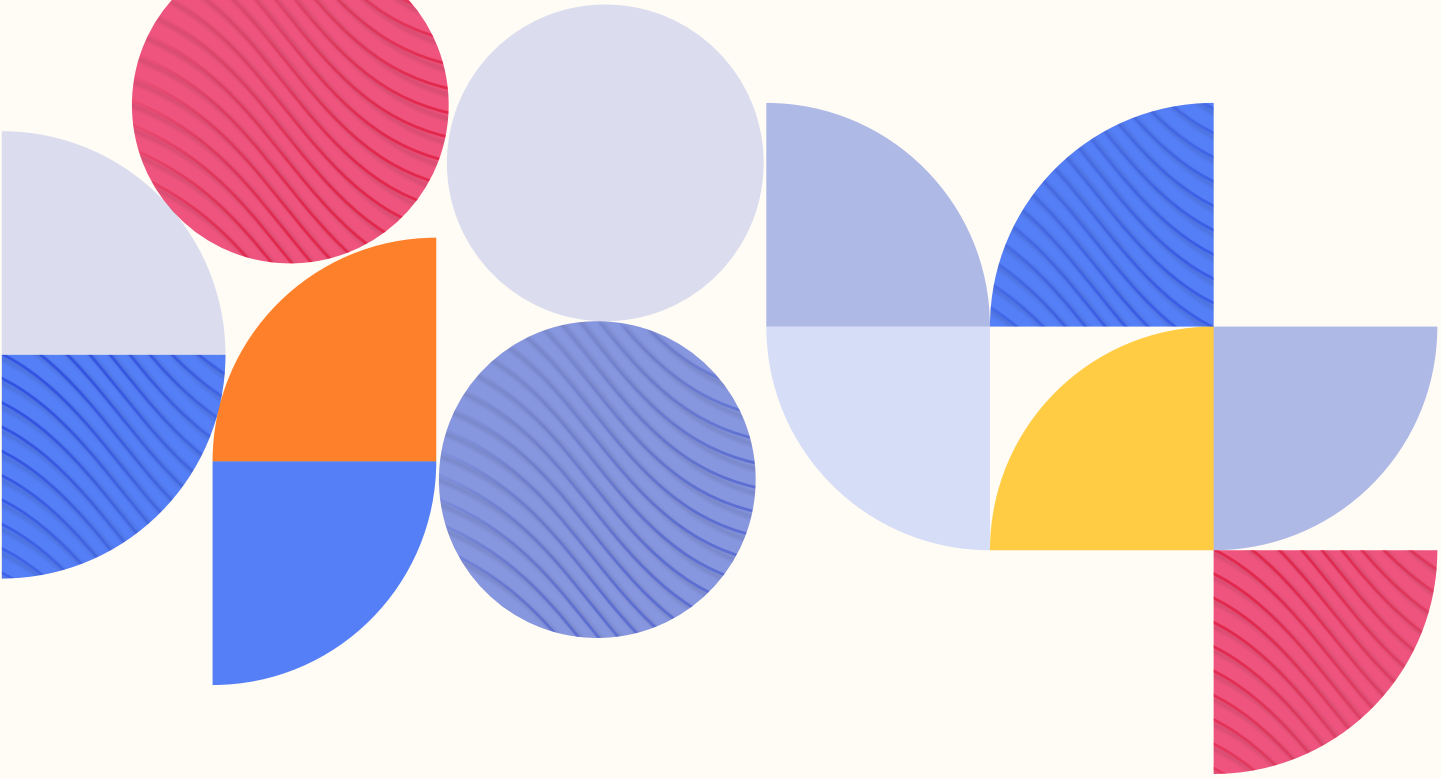
Despite obvious evidential support for general disease prevention, its use in clinical settings remains limited. As of 2015, only 8 percent of US adults over age 35 received all recommended high-priority preventive services, with men being less likely than women to receive such services. Expanding the reach of preventive care requires systematic change—including institutional leadership, integrated care teams, cultural shifts in care delivery, and greater patient engagement. The following sections explore how prevention and early intervention strategies, modifiable risk factors, and holistic tools like health scores can support brain health and reduce the burden of neurological and psychiatric conditions.

HEALTH-CARE INFRASTRUCTURE TO ADDRESS BRAIN DISEASE

The US health-care system is fragmented and largely reactive, prioritizing treatment over prevention. Despite spending nearly 18 percent of its GDP on health care, the US sees poorer outcomes and shorter life expectancy than its high-income peers. Structural challenges—including fragmented payment systems, cost barriers, and insufficient investment in preventive care—undermine efforts to build a sustainable, equitable health-care infrastructure.

As the US seeks to improve health outcomes and address growing concerns like chronic disease and brain health, understanding both domestic and international models of health-care delivery offers critical lessons. The following sections examine the US health-care system's current structure, emerging reforms, and global approaches that highlight pathways toward a more effective and inclusive brain-health-care system.

A 2019 Centers for Disease Control and Prevention study confirmed that providers are aware of recommended preventive care services and understand the benefit of preventing disease for the patient and the larger health-care system but do not prioritize preventive care due to a lack of financial incentives. This contributes to a reactive health-care system focused on managing disease rather than preventing it.



US Health-Care Infrastructure

The US continues to lag behind on overall health system performance, despite spending significantly more on health care than peer countries. This includes spending across public programs (Medicaid, Children's Health Insurance Program [CHIP], Medicare, military plans), private employer-sponsored insurance, and out-of-pocket expenses. In 2023, annual per-person spending reached $14,570 in the United States. Americans pay nearly double per capita compared to the next-closest country, yet millions remain uninsured or underinsured due to high out-of-pocket costs and gaps in coverage.

As of 2021, 8.3 percent of the US population was uninsured—a stark contrast to other high-income countries where nearly all residents have health insurance. Especially without insurance, high medical expenses lead nearly half of working-age adults to delay or skip necessary care. While 2010's passage of the Affordable Care Act (ACA) significantly increased health insurance coverage for Americans, recent policy changes are likely to result in 16 million more uninsured Americans by 2034, according to analyses from the nonpartisan Congressional Budget Office.

Expanding preventive care coverage and ensuring access to essential services like dental, vision, and hearing care are critical steps toward improving health outcomes, reducing inequity, and reducing overall health-care expenditures by preventing the development of diseases and chronic conditions that require more intensive and advanced care. Expanded coverage can take various forms, including the government sponsoring programs and private health insurers creating more affordable plans.

In 2022, the Inflation Reduction Act (IRA) represented a step forward by extending premium subsidies under the ACA and lowering prescription drug costs for Medicare beneficiaries. Starting in 2026, the IRA will require the Centers for Medicare & Medicaid Services (CMS) to negotiate certain prescription drug prices, potentially reducing federal spending by $100 billion over the next decade. However, broader reforms are still needed to make health care as accessible and affordable as it is in other developed countries. Crucially, when people have insurance, they are more likely to seek preventive care, such as regular screenings and vaccinations, which can mitigate the need for intensive, costly treatments later.

Standard Payment Models

Standard US payment models include public and private insurance and the progressively more available integrated health-care delivery systems. These models make up the core of how health care is financed and delivered in the US, though each has varying impacts on access, affordability, and care quality.

Most public and private payers still rely heavily on fragmented, fee-for-service models, which reimburse providers for the volume of care rather than the value delivered. In these models, patients often navigate different providers, systems, and insurers with no incentive for having coordination among them. While integrated health-care delivery systems propose increased efficiency, the current standard payment models for health care in the US mostly dissuade disease prevention.

Standard Health-Care Payment Models

Public insurance programs—such as Medicare, Medicaid, and CHIP—provide coverage for older adults, low-income individuals, and children, respectively, and are funded through federal and state governments. CMS administers Medicaid for over 70 million Americans, offering essential coverage that includes preventive care, mental health, dental, and age-related brain health services. As individuals turn 65, they transition to Medicare, which currently covers 60.6 million people—a number expected to grow to 74 million by 2034. With Medicare spending projected to nearly double from 3.1 to 5.4 percent of US GDP by 2053, ensuring both Medicaid and Medicare prioritize prevention and chronic disease management is critical to improving health outcomes and sustaining the health-care system.

Private insurance is primarily offered through employers or purchased individually. Coverage must meet minimum coverage standards set by the ACA, including preventive and wellness services. In 2023, 61 percent of adults between 19 and 64 years old had access to health insurance through their employer or a family member's employer. As evidence mounts about the efficacy of early detection and preventive measures for brain health, private insurance companies have gradually expanded coverage for screenings, wellness visits, and mental health services to address the growing prevalence of cognitive decline and mental health concerns among aging populations. Many private health insurance plans now cover annual wellness visits and screenings that help catch these conditions in early stages.

Integrated health-care delivery systems (e.g., Kaiser Permanente) aim to streamline care across providers and services—often combining insurance plans, hospitals, and physician groups under one organizational umbrella. Example models include accountable care organizations and health maintenance organizations. These models have a financial incentive to keep members healthy to minimize insurer costs associated with chronic health conditions. Some organizations may pass these savings on to members in the form of lower premiums or enhanced services. These systems also promote efficiency by reducing duplication of services and incentivizing high-quality, cost-effective care.

Newer Payment Models

Traditional fee-for-service models in the US prioritize treatment over prevention. This means preventive services often lack reimbursement codes, discouraging providers from delivering proactive care. Many nonspecific preventive services, such as lifestyle counseling on diet, exercise, and stress management, receive minimal reimbursement, which discourages providers from allocating the time needed for meaningful prevention-focused consultations.

Addressing these issues requires systemic changes that include policy reforms, payment model restructuring, and greater investment in preventive care. New models like value-based care, the Collaborative Care Model (CoCM), and social impact bonds (SIBs) are gaining interest. These approaches reward improved outcomes, encourage early intervention, and shift care toward long-term sustainability.

- **Value-based care** ties payments to patient outcomes rather than service volume, rewarding providers for improving patient wellness and managing chronic conditions. Though adoption in the US is still limited, countries like Singapore have successfully implemented similar models using population-based payments and preventive incentives.
- **CoCM** is both a care delivery and payment model that integrates behavioral health into primary care. Backed by the American Psychiatric Association, CoCM became reimbursable under Medicare in 2017 via dedicated billing codes. It builds capacity in primary care by training care managers to coordinate with psychiatrists and involve patients' families, offering a flexible, holistic, evidence-based approach to mental health care.
- **SIBs** are innovative funding models where private investors fund preventive health programs (e.g., targeting diabetes or substance use) and are repaid only if outcomes are met. While still emerging in US health care, SIBs offer a promising way to fund creative, results-driven approaches to chronic disease prevention and cost control.

Looking Ahead: Policy and Equity

The future direction of US health policy remains uncertain amid shifting political priorities, but systemic pressures—such as rising costs and workforce shortages—continue to challenge access and equity. Without addressing the underlying drivers of spending, including chronic disease burden and long-term care needs, financial strain on the health system is likely to intensify. Older adults and underserved populations remain especially vulnerable to coverage gaps, limited access to care, and the high costs of managing complex conditions. As reliance on community-based services increases, ensuring affordability and sustainable support for these models will be essential.

Investments in underserved communities can improve access to affordable care, nutritious food, safe environments for physical activity, and health education. Additionally, efforts to reduce inequity must confront systemic discrimination in care delivery. This includes adopting culturally competent practices, increasing workforce diversity, and expanding language access services to improve communication and trust with diverse populations.

Ultimately, building a more equitable and sustainable health-care system will require aligning payment incentives with prevention, addressing SDOH, and ensuring that all individuals can access the care they need.

Health Infrastructure Outside the US

Unlike the US-based health-care payment system, which typically requires individuals to pay out of pocket or through private insurance for medical services, many peer nations' health-care systems offer low-cost or free care at the point of service. These countries fund their health-care systems primarily through higher taxation, ensuring that most residents have access to essential health services without direct payment, thus reducing financial barriers to care.

Countries like the UK, Germany, Australia, Norway, Sweden, the Netherlands, and Japan consistently rank high in health-care affordability, with strong outcomes due to systems of universal or near-universal coverage. While the UK operates a publicly funded health system through the National Health Service, countries like the Netherlands achieve universal access through mandatory private insurance that operates under strict government regulation. Most high-income countries use a hybrid approach, combining public and private insurance to ensure access to preventive services such as screenings, mental health care, and wellness interventions. For example, Taiwan operates a highly effective National Health Insurance program, providing comprehensive, mandatory coverage funded through contributions from the government, employers, and individuals.

In contrast, LMICs face significant disparities in health-care access, funding, and quality. For example, India continues to struggle with underfunding and fragmented coverage; as of 2018, only 37 percent of its population had any form of health insurance. Brazil offers universal coverage through its public system, *Sistema Único de Saúde*, but challenges such as regional inequity and dual use of public and private care limit efficiency and equity.

In Africa, progress is hindered by limited financial resources and infrastructure. Despite accounting for 25 percent of the global disease burden, African countries collectively represent just 1 percent of global health expenditures. Following the 2001 Abuja Declaration, which called for African nations to allocate at least 15 percent of their national budgets to health care, only a few countries—such as Rwanda, Malawi, and Burkina Faso—have met this target.

Rwanda stands out for its community-based insurance model, *Mutuelles de santé*, which covers over 90 percent of the population through a mix of government support, premiums, and donor contributions. In contrast, coverage in Nigeria remains around 5 percent, and only about 16 percent of South Africans have private health insurance, while the majority rely on an under-resourced public system.

While cultural factors—especially regarding mental health—affect service delivery in some African contexts, the primary barriers remain financial constraints, infrastructure gaps, and critical shortages of trained health workers. Across LMICs, workforce limitations, underdeveloped infrastructure, and underinvestment in public systems continue to restrict progress. The extreme diversity in care models and accessibility, insurance coverage, health literacy, and cost are in contrast to the universality of benefits that disease prevention creates. Expanding investment in prevention and primary care is essential to closing global health equity gaps, reducing long-term costs, and ensuring access to quality care for all.

Global Brain Health and Health System Challenges

Comparing health-care systems is complex, as performance varies widely based on each country's social, economic, and political context. This variability influences how effectively brain health is addressed. Countries such as Canada, France, Germany, Japan, the UK, and South Korea have identified key brain health policy targets—including dementia risk reduction, early diagnosis, caregiver support, and safe environments.

Primary care is essential to effective, cost-efficient health systems, but the US faces a severe shortage. Few US physicians practice in primary care, with medical education and financial incentives steering graduates toward other specialties. As a result, access to routine and preventive care is limited.

Recent trends show increasing consolidation of primary care practices by large health systems and private equity firms. While this may improve resources and efficiency, it also raises concerns about prioritizing profit over patient-centered care and reducing access to preventive medical care.

Globally, countries are experimenting with health-care models that emphasize accessibility, prevention, and community engagement. Care delivery in many nations, for example, Uganda, Thailand, and Bhutan, relies on trained community health workers to deliver basic care and connect patients to higher-level services. These decentralized, tech-assisted approaches—such as Bhutan's use of mobile algorithms and strong family networks—highlight how community-led care can improve health outcomes even in resource-constrained settings.

Additionally, governments and nonprofit organizations worldwide are developing innovative brain health programs. In Scotland, Aberdeen Brain Health Service provides preventive brain care through a small multidisciplinary team consisting of a psychiatrist, an advanced nurse practitioner, and an administrator, largely funded by public and nonprofit sources. In France, the VBHI Brain Resiliency Living-Lab in Bordeaux brings in Bordeaux brings preventive stroke care by traveling to underserved areas. Meanwhile, in Hong Kong, high hospital costs have driven an increased focus on prevention to mitigate expensive inpatient psychiatry treatments.

Emerging Innovations in Brain-Health-Care Delivery

Innovations in tools, technology, and models can equip communities and governments and fortify infrastructure to implement improved brain health services and delivery. Advances in telemedicine, mobile health tools, and AI are helping expand access to preventive care, cognitive screenings, and mental health support, particularly in remote and underserved regions. For example, Singapore has integrated mental health services into primary care clinics, while the UK's "social prescribing" initiatives link patients to community-based cognitive and emotional supports. In low-resource settings, such as Bhutan, mobile health apps and community health workers are increasingly used to deliver brain health education and early interventions. These emerging models demonstrate the potential of technology and integrated care approaches to advance brain health globally.

To meet growing brain health needs, both globally and in the US, health systems must invest in primary care, workforce development, and updated technology. Expanding telehealth, training opportunities, and community-based roles—like pharmacists, community navigators, and lay health workers—can improve access, reduce inequity, and support prevention. If successful, locally driven solutions in countries like Bhutan and Uganda offer valuable models that could be adapted to strengthen brain-health-care delivery in comparable settings, the US, and beyond. To ensure the viability and scalability of these initiatives, international collaboration and policy advocacy will be key, as coalition-based efforts are often more effective than isolated initiatives.

INEQUITABLE ACCESS AND SDOH

Addressing inequity in dementia, stroke, LLD, and other chronic brain conditions requires systemic solutions that focus on the root causes of inequity, such as access and SDOH. While individual modifications in risk factors are important, the structural barriers shaped by income, geography, education, and discrimination limit access to those very choices, particularly for marginalized communities.

Socioeconomic and geographic factors influence not only access to care, but also exposure to environments that promote or undermine health. Rural and low-income communities often lack basic health infrastructure, such as specialized providers, rehabilitation services, and transportation. Similarly, neighborhoods with limited access to healthy food, safe spaces for activity, and health education face elevated risks for cardiovascular disease and related neurological conditions.

Education plays a central role in shaping lifelong health. Along with determining job attainment and income level, it influences where we live and with whom we interact. In addition, people with higher levels of education tend to adopt healthier behaviors, engage in preventive care, and better manage chronic illnesses. Thus, educational inequity—deeply linked to race and ethnicity—reinforces cycles of poor health and limited opportunity.

To reduce brain and overall health inequities, health-care systems must adopt culturally responsive, community-informed approaches, shift toward prevention, and integrate care for co-occurring conditions. Technologies like telehealth and AI, when implemented equitably, can expand access, but only if coupled with investment in digital literacy and infrastructure. Solutions must also go beyond the health-care system. Policy changes at all levels should expand access to affordable care, invest in underserved regions, and address the social environment patterns that contribute to poorer health outcomes.

Ultimately, improving outcomes in dementia, stroke, and depression requires coordinated action for medical needs as well as the broader systems that shape who has access to living a healthy life.

Prevention, Early Detection, and Intervention

Preventing brain diseases before they develop or progress is one of the most effective strategies to reduce long-term health-care costs, improve quality of life, and promote cognitive resilience across the lifespan. To be successful, prevention programs must be supported by strong public health communication, education, and policy. Clinical care strategies and public health campaigns grounded in current brain science can increase awareness, reduce stigma, and ensure equitable access to early diagnostics and intervention services. Integrating brain health into broader preventive care, much like what is done for cancer or heart disease, represents a missed but critical opportunity in the current health-care landscape. Prevention efforts are typically categorized into three levels:

- **Primary prevention** focuses on promoting healthy behaviors—such as regular physical activity, nutritious diets, vaccinations, and reduced exposure to known risk factors—to prevent disease onset.
- **Secondary prevention** entails engaging in more targeted behaviors or preventive interventions after an event, such as a stroke, or after a risk profile has been identified.
- **Tertiary prevention** aims to manage established conditions like dementia, reducing complications and supporting quality of life for both patients and caregivers. It includes measures to prevent hospitalizations or medication errors.

Early detection plays a central role in this continuum and involves screenings and diagnostic tools to identify conditions like cognitive decline in their earliest stages, enabling timely intervention that may delay or halt disease progression. Tools such as cognitive assessments, brain imaging, and biomarker testing can identify neurodegenerative changes well before symptoms appear. Routine brain health screenings, if incorporated into preventive health visits, could enable timely interventions to delay dementia or prevent recurrent strokes. Importantly, many brain health initiatives emphasize that it is "never too early and never too late," an ethos that underscores brain care as a lifelong endeavor with meaningful benefits no matter the stage of life.

Interventions, both preventive and therapeutic, are designed to improve outcomes by preventing disease, slowing progression, or managing symptoms. These may include medical treatments, lifestyle modifications, or cognitive therapies. For example, Finland's FINGER study combined cognitive training, nutrition, physical activity, and vascular monitoring to improve cognition in older adults. While promising, scaling such multifaceted programs remains challenging due to resource demands and the late-life focus of current interventions.

Data-driven strategies help tailor preventive services and interventions to diverse populations. The US Preventive Services Task Force has published 15 recommendations for evidence-based preventive services delivered through primary care and professional societies worldwide for managing modifiable risk factors for heart disease and stroke. However, evidence for dementia recommendations was deemed insufficient in 2020; as of June 2025, an update for the topic is in progress.

Public health initiatives like the Healthy People Initiative demonstrate the long-term impact of coordinated, evidence-based goals in improving community health and could guide similar efforts for brain health. Nonprofits such as the Physiatry Pharmacist Collaborative use data to adapt preventive protocols, engaging patients at pharmacies instead of during a doctor's visit, to ameliorate widespread, chronic conditions, including age-related brain diseases.

Together, prevention, early detection, and intervention form a cohesive framework for improving brain health. Early detection serves as the bridge, connecting proactive risk reduction to effective care. Realizing the potential of this framework requires system-wide investment in multi-specialty training, community engagement, evidence-based lifelong interventions, and health-care structures that incentivize prevention.

Scores as a Holistic Measure of Health

Health is a multidimensional concept encompassing physical, mental, and social well-being, extending beyond the mere absence of disease. To quantify this complexity, various health scores and indices have been developed to provide holistic measures of health status, integrating aspects of quality of life, risk factors, and outcomes. Originally created to support clinical decision-making and track patient health, these tools have evolved to become more intuitive and user friendly, even employing "direct-to-consumer" strategies. Some tools may prove to be transformative in health care, while others will continue facing challenges with consistency and integration.

HEALTH SCORING

Health scoring emerged in the 20th century as public health and clinical care began prioritizing quantifiable health measures. Historically, cardiovascular scoring has been a particular focus. A landmark example is the Framingham Heart Study, which began in 1948 and identified key cardiovascular disease risk factors, leading to the widely used Framingham Risk Score.

Other cardiovascular risk scoring systems include the AHA's Life's Simple 7 (2010; updated in 2022 to Life's Essential 8, adding sleep as a key factor). These tools provide scoring to guide prevention and promote lifelong heart health. In 2023, AHA launched the PREVENT calculator, incorporating kidney health, a step toward more comprehensive health profiling.

Some health scoring metrics incorporate population-wide metrics, such as WHO's DALY, a crucial tool for evaluating disease burden and guiding resource allocation. There are a few historical examples of brain and mental health scoring systems. For instance, the Mini-Mental State Examination, developed in 1975, was one of the earliest tools to offer a standardized way to assess cognitive function and detect neurological conditions. However, the historical focus on cardiovascular risk scores highlights the need for more holistic, integrated health scoring systems that consider brain and mental health.

BRAIN HEALTH SCORING

Brain health scoring systems have emerged to fill a critical gap in cognitive and mental health assessment (**Table 3**). The Brain Health Index, launched in 2021 by the Center for Brain Health at the University of Texas at Dallas, has been used by over 35,000 people in 60 countries. It tracks 22 lifestyle and cognitive measures—such as social engagement and well-being—in adults aged 18 to 95, focusing on continuous improvement rather than diagnostic labels.

TABLE 3: BRAIN HEALTH SCORES

	Digital Platform	Health Education/ Diagnosis Support	Modifiable Risk Factors	Publicly Accessible	Cognitive Assessment Only	Multi-Modal Assessment
AARP Staying Sharp		●	●	●		●
BetterBrain	●	●	●	●		●
BrainMD		●	●	●	●	
BrainSpan				●		●
Brain Care Score		●	●	●		●
Brain Health Index	●		●			●
Brain Health Scotland		●	●	●	●	
Neurotrack	●	●	●	●	●	

Source: Milken Institute (2025)

Brain health scoring offers a practical tool to help individuals and families take ownership of brain care. By assessing modifiable risk factors—such as physical activity, blood pressure management, cognitive engagement, social connection, and mental health status—brain care scores provide a holistic snapshot of current wellness and a road map for improvement. **Empowering people with accessible, evidence-based metrics not only supports personal health decisions but also drives a broader cultural shift toward proactive, lifelong brain care.**

Several self-assessment tools have followed, including American Association of Retired Persons (AARP) Staying Sharp, Brain Health Scotland's Brain Health Quiz, BrainSpan, BrainMD, BetterBrain, and Neurotrack. These platforms aim to make cognitive health monitoring accessible to the public through lifestyle-based assessments. However, challenges remain in standardizing metrics, keeping tools up to date with evolving science, and incorporating SDOH.

The Brain Care Score (BCS), developed at the McCance Center for Brain Health at Massachusetts General Hospital, is designed for use not only in routine clinical care but also as a simple self-assessment tool for individuals. It offers a structured, multidimensional assessment (**Figure 2**). It evaluates 12 modifiable risk factors across physical (e.g., blood pressure, A1c), lifestyle (e.g., sleep, activity), and social (e.g., stress, relationships) domains. The 21-point system makes brain health a measurable and actionable target in both primary care and direct-to-consumer settings. Additionally, BCS developers envision an adaptive tool for use across diverse health-care settings, especially as point-of-care experiences vary greatly across cultures.

In addition to the aforementioned research studies, efforts like the Barcelona Brain Health Initiative are also advancing population-level models that integrate cognitive, lifestyle, and social factors. Meanwhile, digital programs such as BrainHQ and Strategic Memory Advanced Reasoning Training (SMART) offer cognitive training modules that complement prevention strategies and support lifelong brain health.

Together, these tools reflect a broader shift toward integrated, personalized health management. While more standardization and equity-driven updates are needed, brain health scores and related models offer promising pathways to align cognitive, cardiovascular, and emotional wellness, helping reduce disparities and promote resilience across the lifespan.

FIGURE 2: BRAIN CARE SCORE ASSESSMENT SHEET FROM THE MCCANCE CENTER FOR BRAIN HEALTH

This 12-question quiz, an accessible structure for assessing brain health, is designed to empower individuals to take better care of their brains.

LIFESTYLE	Nutrition	Dietary habits: • 4-5 servings of fruit and vegetables per day; • 2 servings of lean protein per day • 3 or more servings of whole grains per day • Less than 1,500 mg of sodium per day • Less than 36 oz of sugar sweet beverages (soda, juice, etc.) per week	POINTS:	
		Typical weekly diet does not include at least 2 of the recommendations above	0	
		Typical weekly diet includes 2 or more of the recommendations above	1	
		Typical weekly diet includes 3 or more of the recommendations above	2	
	Alcohol	4 or more alcoholic drinks per week	0	
		2-3 alcoholic drinks per week	1	
		0-1 alcoholic drinks per week	2	
	Smoking	Current smoker	0	
		Never smoked or quit more than a year ago	3	
	Aerobic Activities	Less than 150 minutes of moderate or 75 minutes of high intensity physical activity per week	0	
		At least 150 minutes of moderate physical activity (ex. walking) or 75 minutes of high intensity physical activity per week	1	
	Sleep	Untreated sleep disorder and/or less than 7 hours of sleep per night	0	
		Treated sleep disturbances and at least 7 hours of sleep per night	1	
SOCIAL EMOTIONAL	Stress	High level of stress that often makes it difficult to function	0	
		Moderate level of stress that occasionally makes it difficult to function	1	
		Manageable level of stress that rarely makes it difficult to function	2	
	Social Relationships	I have few or no close connections other than my spouse or children	0	
		I have at least two people, other than my spouse or children, that I feel close with and could talk about private matters or call upon for help	1	
	Meaning in Life	I often struggle to find value or purpose in my life	0	
		I generally feel that my life has meaning and/or purpose	1	
PHYSICAL	Blood Pressure	Greater than 140/90; or I do not know my resting blood pressure	0	
		Between 120/80 and 139/89	2	
		Less than 120/80	3	
	Blood Sugar	Greater than 6.4; or I do not know my A1c score	0	
		Between 5.7 and 6.4	1	
		Less than 5. 7	2	
	Cholesterol	190 mg/dL or above; or I do not know my cholesterol levels	0	
		No treatment required, or less than 190 mg/dL	1	
		If cardiovascular disease is present, LDL is in accordance to the latest CDC recommendations	1	
	BMI	BMI Below 18.5 kg/m^2; or Underweight	1	
		BMI Between 18.5 - 25 kg/m^2; or Average	2	
		BMI Between 25 - 29.9 kg/m^2; or Overweight	1	
		BMI Greater than 30 kg/m^2; or Obese	0	

Global Brain Care Coalition + Massachusetts General Hospital
Founding Member, Mass General Brigham

BRAIN CARE SCORE (0-21)

Sources: Massachusetts General Hospital (2025), Global Brain Care Coalition (2025)

Bridging Public Health Approaches and Clinical Care Strategies

Improving brain health requires bridging the divide between clinical care, which focuses on individual treatment, and public health, which addresses prevention at the population level. Closer collaboration between health systems and public health agencies is essential to promote brain health education, facilitate early detection of conditions like dementia, and integrate community-based interventions into routine care. Such efforts could make brain health awareness as ubiquitous as heart health awareness.

Current public health initiatives advance brain health by promoting cardiovascular health, improving access to care for managing hypertension and diabetes, and supporting healthy aging through education. The urgent imperative for brain disease prevention has also triggered public health initiatives with modifiable risk factors as a central focus. These approaches align with global strategies, such as WHO's Global Action Plan on the Public Health Response to Dementia 2017–2025, emphasizing proactive care over reactive treatment. The brain health movement can also draw from successful policy-driven public health programs that have population-wide impacts for dietary habits. For instance:

- Resolve to Save Lives' Sodium Reduction Framework supported WHO in developing the first-ever global sodium benchmarks in packaged foods and supported 14 governments in reducing sodium in government-provided meals by shaping healthy public food procurement initiatives.
- The China Salt Substitute and Stroke Study demonstrated that replacing standard salt with low-sodium, potassium-enriched salt led to a 14 percent reduction in strokes and a 13 percent decrease in major cardiovascular events.
- Public health agencies in the Philippines, in collaboration with Johns Hopkins University, developed models to assess the impact of taxing ultra-processed foods. Consumer-targeted efforts, alongside other initiatives like warning labels for high-salt foods, have contributed evidence for positive policy changes.
- In Chile, a pioneering front-of-pack labeling system uses a simple black stop sign to indicate high levels of sugar, salt, and saturated fat, making it easy for consumers to make healthier choices. This visible, straightforward design has been shown to significantly reduce unhealthy ingredients in packaged foods and is now a model for other countries aiming for effective, evidence-based public health improvements.

By focusing on population-level impacts and policy reform, these efforts aim to reduce the intake of unhealthy ingredients on a broad scale, ultimately improving health outcomes across communities.

Public Health Improvements Through the Icelandic Model

When it comes to brain health, much of the narrative regarding modifiable risk factors focuses on individual responsibility and behavior changes. But sustained improvements to brain health require a holistic response that includes community-based public health measures as well. Pulling from success stories—for example, the **Icelandic Model for health improvement**—public health initiatives for brain care may bolster environmental support to encourage better individual choices.

The Icelandic Model emerged in the late 1990s as a national response to alarmingly high rates of youth alcohol and drug use. US-based responses like the D.A.R.E. initiative focused on individual behavior, but this model took a systems-level, community-based approach grounded in social science and prevention theory. The key components included deeper community involvement, more structured activities targeting shifting social norms, regular research and feedback, and cross-sector collaboration between schools, families, and local governments.

As a result, the percentage of 15- and 16-year-olds who had been drunk in the past month dropped from 42 percent to 5 percent between 1998 and 2016, and similar declines were seen in smoking and drug use. The model is now considered a leading example of environmental prevention, where long-term behavioral change is driven by reshaping the broader context in which people make choices.

Despite these successes, public health and health-care systems in the US often operate in silos. Strengthening collaboration requires health systems to invest in community health and foster communication with local public health entities. Conversely, local public health services, uniquely embedded within communities, are well-positioned to build connections with various community stakeholders and serve as a foundation for diverse health initiatives.

Through strategic partnerships, clear and consistent public health messaging, and community investment, a collaborative approach to brain health can make prevention a routine part of health care, enhance early detection, and create an environment that fosters healthy habits across the lifespan. Together, these efforts can shift the paradigm of brain disease from reactive treatment to proactive management, benefiting individuals and communities alike. **Examples of collaborative efforts in brain health include:**

1. **Alzheimer's and dementia care networks:** Collaborations between state and local health departments and the Alzheimer's Association focus on early diagnosis, education, and community support, offering services like memory screenings, caregiver assistance, public awareness campaigns, and referrals to local resources.

Outreach strategies such as integrating HIV prevention efforts in women's hair salons in South Africa have demonstrated that community-based settings can be meaningful touchpoints for public health initiatives. Similarly, brain health programs could use community hubs like YMCAs, senior centers, and rehabilitation clinics as venues for outreach, education, and early intervention, reinforcing public health messaging in familiar, trusted spaces.

2. **Mental health and public health initiatives:** In Massachusetts, local health departments work closely with the Massachusetts Department of Mental Health and community organizations to improve mental health services, particularly in schools. By focusing on early intervention for youth facing stress, anxiety, and depression, these partnerships address key factors that influence long-term brain health outcomes.
3. **Community-based care for brain injuries:** Local health departments often partner with organizations like the Brain Injury Association of America to address traumatic brain injuries in communities, providing rehabilitation resources and advocating for better brain injury policies.
4. **Healthy aging collaboratives:** Aging populations are a key focus for brain health initiatives. Public health departments frequently collaborate with aging services organizations, senior centers, and universities to promote healthy aging. Initiatives like the Age-Friendly Community project, supported by AARP and WHO, aim to reduce social isolation among older adults and promote cognitive health.

These partnerships demonstrate the value of coordinated community-centered strategies that use diverse expertise to create a more comprehensive approach to addressing brain health. By connecting public health efforts with health-care providers, these partnerships support the effective delivery of prevention strategies and early interventions across communities.

A GLOBAL ECOSYSTEM PROMOTING BRAIN HEALTH

Neurological and psychiatric diseases affect millions worldwide and contribute significantly to the global burden of DALYs, underscoring a critical public health challenge. Research shows that addressing modifiable risk factors can substantially reduce the incidence of these brain disorders. Beyond individual responsibility for health behaviors, real impact requires addressing SDOH, strengthening health-care infrastructure, and incorporating culturally sensitive, community-focused approaches. To support behavioral change and public health responses, organizations across the globe are building a dynamic ecosystem dedicated to brain health.

Over the past two decades, there has been significant progress in advancing brain health, with various organizations—from large intergovernmental bodies to small nonprofits—working to prioritize brain health in broader aging and health discussions. These efforts aim to increase awareness, integrate brain health into health-care systems, and combat the stigma associated with cognitive decline and neurological diseases. The cognitive abilities of a community, city, state, or country are integral to its economic growth because they enable populations to adapt in the face of economic shocks, rapid technological change, and environmental challenges. Fostering a comprehensive approach to care and prevention within the global brain health ecosystem is key to economic sustainability and quality of life.

US Brain Health Ecosystem

Several US sectors show increasing recognition of brain health as essential to quality of life, health-care cost management, and public health. This ecosystem is powered by stakeholders from government agencies, nonprofits, academic institutions, and industry that collectively prioritize brain health through research, policy, and community engagement.

Government agencies like the Centers for Disease Control and Prevention and National Institutes of Health drive key brain health initiatives. Public health programs focus on integrating brain health into policy, supporting mental health and cognitive well-being, and addressing inequities in access to care. Government-backed research has explored factors affecting brain health across populations, with special attention to aging and prevention, recognizing the need for inclusive and evidence-based strategies.

Nonprofits contribute significantly by mobilizing community resources, raising awareness, and providing funding for brain health education, support services, and public outreach. Organizations like the American Academy of Neurology, AARP, AHA, and Alzheimer's Association are vital in advancing public understanding of brain health across life stages, often bridging gaps in government support and aligning efforts with the latest research.

Academic and medical institutions offer critical research and innovation pipelines, studying cognitive health across demographics and exploring the effects of lifestyle, environmental, and social factors on brain resilience. Through partnerships, these institutions provide a knowledge base for developing effective interventions, so that brain health strategies remain grounded in rigorous research.

While nonprofit funding challenges exist, businesses and industries increasingly fund brain health initiatives, emphasizing proactive, preventive models that reflect the economic importance of maintaining cognitive health. The concept of brain capital has gained traction, underscoring brain health's role as a valuable resource for societal well-being and productivity.

This diverse US brain health ecosystem positions the country as a driving force in brain health, advancing global efforts through focused research, policy innovation, and multi-stakeholder collaborations. These combined efforts aim to embed cognitive resilience and disease prevention within the broader public health framework, ultimately supporting healthy aging and enhancing societal resilience.

Global Brain Health Ecosystem

The global brain health ecosystem has grown into a collaborative network of governments, health organizations, academic institutions, nonprofits, and private-sector players, all dedicated to addressing the rising prevalence of brain diseases and cognitive impairments. This ecosystem is characterized by a shared commitment to advancing brain health through prevention, research, and accessible care, responding to the immense social and economic burden brain disorders impose worldwide.

At the global level, brain health initiatives are shaped by cross-border partnerships, intergovernmental frameworks, and community-focused models. Organizations like WHO, United Nations, UNICEF, Alzheimer's Disease International, and the World Dementia Council collaborate to establish guidelines, advocate for policy changes, and build resilience in health systems, with a strong focus on prevention and community engagement. These partnerships emphasize the need for evidence-based, culturally adapted strategies to manage and prevent conditions like dementia, stroke, and depression on a large scale.

The international brain health community's continued investment in capacity building, culturally tailored interventions, research, and data-informed policy strategies, enables it to work toward a brain-healthier global ecosystem. Only collective approaches can meaningfully reduce the personal and societal costs of neurological and psychiatric conditions and improve health outcomes for populations worldwide.

CONCLUSION: A GLOBAL COMMITMENT TO BRAIN HEALTH

The global focus on brain health reflects an understanding that addressing brain health challenges requires a comprehensive, collective approach, one that not only encompasses research and clinical care but also recognizes the profound social, cultural, and economic impacts of brain diseases. Global trends show a shift toward preventive care, lifestyle-based interventions, and capacity-building in underserved populations. With continued dedication, empowering actions in brain health can continue its build toward a future in which prevention is prioritized, disease impacts are mitigated, and people worldwide benefit from improved brain health.

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ABOUT THE AUTHORS

Aggie Stephens is an associate director for SPARC within the Milken Institute Strategic Philanthropy pillar. With a background in clinical neuroscience, she specializes in science philanthropy, research-sector development, and global collaborations that maximize the impact of investments in science. At Milken, she advises on giving strategies and implementation tactics that holistically benefit the research ecosystem. Before joining the Institute, Stephens was a science program specialist at The Kavli Foundation, where she acted as program director for the International Brain Initiative, facilitating cross-sector collaborations for large-scale neuroscience projects. She was previously the program manager for ENIGMA, an international consortium in neuroimaging and genomics. Stephens earned a bachelor's degree from the University of North Carolina and a master's in clinical science from the University of Colorado. She serves as a board member for the Institute of Neuroethics and is based in the Institute's Washington, DC, office.

Samantha Kost, PhD, is a former senior associate with Milken Institute Strategic Philanthropy. As a member of the SPARC team, she analyzed biomedical research areas in partnership with philanthropists to fund innovative projects and ensure investments make equitable, transformative impacts in science and health. She received her PhD in neuroscience and psychology from Indiana University, where her research focused on using computational approaches to reveal patterns of information processing in high-dimensional neural data. She then completed a postdoctoral research fellowship in clinical neuroscience at the University of Sussex Brighton and Sussex Medical School. This broadened her expertise to include clinical research practices and ethics, with an emphasis on the relationship between brain-body interactions and mental health. Kost also holds a BS in mathematics from North Carolina State University.

Ishita Das, PhD, is a director on the SPARC team at Milken Institute Strategic Philanthropy, where she leads the science ecosystem and cross-disciplinary portfolio and advises philanthropic organizations to implement strategies and guide investments that advance health research priorities. Her expertise lies within biomedical research, science policy, stakeholder engagement, workforce diversity, strategic planning, and project management. Previously, Das was at a management consulting firm, where she led cross-functional teams to implement science and health initiatives for federal agencies, nonprofits, and public-private partnerships, including the National Institutes of Health, the Office for Human Research Protections, the National Human Genome Research Institute, the National Institute of Environmental Health Sciences, the Patient-Centered Outcomes Research Institute, and CMS. Das received her bachelor's degree in biology from the University of North Carolina at Chapel Hill and her doctorate in cellular and molecular biology from the University of Michigan. She is based in the Institute's Washington, DC, office.

Katherine Eyring, PhD, is a senior associate with the Milken Institute SPARC team. She brings broad expertise in neuroscience and genomics research, as well as a passion for improving neuropsychiatric care, to her work maximizing philanthropic impact in science. Eyring received her bachelor's degree in neuroscience from Wellesley College and her doctorate in neuroscience from New York University. She completed postdoctoral studies of molecular signatures of autism and environmental modifiers of brain development at the University of California, Los Angeles. She is based in the Institute's Washington, DC, office.

Tanisha London, PhD, is a former senior associate with the Milken Institute SPARC team. Her expertise in neuroscience research, grant management, and venture capital provides her with a unique perspective on strategic funding that ensures innovative projects are both financially viable and empirically validated. London has studied various aspects of the brain and behavior, including mood and anxiety disorders, eating behaviors, addiction, and sensory perception. She received her bachelor's degree in psychology from Spelman College and her doctorate in neuroscience from the University of Southern California.

Sylvie Raver, PhD, is a senior director on the SPARC team at Milken Institute Strategic Philanthropy. Raver applies her expertise in neuroscience, neurodegenerative disease, mental health, and biomedical research to identify opportunities for philanthropic investments that can have a transformative impact on medical research and health. She provides guidance to philanthropists, families, and foundations and implements strategies to deploy philanthropic capital to advance research and health priorities. Raver has published work on biomedical strategy with a focus on mental health, neurotechnology, and rare neurodegenerative diseases such as amyotrophic lateral sclerosis and was instrumental in developing a consensus definition for misophonia, a disorder of decreased tolerance to specific sounds or stimuli associated with such sounds. Before joining the Milken Institute, Raver worked for the Society for Neuroscience, where she led global programming and policy efforts in neuroscience training. Raver received her bachelor's degree from Lafayette College, earned a doctorate from the University of Maryland School of Medicine, and conducted postdoctoral training at the National Institute on Aging. She is based in the Institute's Washington, DC, office.


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