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Leveraging Innovation to Improve Alzheimer's Diagnosis and Care in Rural America

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Rural communities face structural barriers to diagnosing Alzheimer's early, which increases burdens on patients and caregivers while raising health-care costs. Policymakers should address the problem by expanding provider training and accelerating scalable diagnostic technologies.

KEY TAKEAWAYS

- Rural communities face heightened Alzheimer's risk due to older population demographics, compounded by structural, geographic, and financial barriers to care.
- Delayed diagnosis increases downstream health-care spending, intensifies caregiver burden, and contributes to workforce losses in already fragile rural economies.
- New technological innovations—including blood-based biomarkers, digital cognitive screening tools, and FDA-approved therapeutics—offer solutions that can expand access and reduce rural health disparities, but they require policy changes to scale.
- Targeted federal and state policies are essential to improve timely Alzheimer's diagnosis in rural America, including strengthening the rural health workforce, accelerating access to innovative diagnostics and treatments, and supporting caregivers.

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INTRODUCTION

Alzheimer's disease represents one of the most pressing and costly public health challenges facing the United States. As the population ages, the prevalence of Alzheimer's continues to rise sharply, with millions of Americans already affected, and projections indicating substantial growth in the coming decades. Despite more than a century of scientific inquiry, Alzheimer's remains difficult to diagnose early, with patients often waiting years between the onset of symptoms and formal diagnosis. These delays limit access to timely care, impede planning and intervention, and contribute to a growing clinical and economic burden borne by patients, caregivers, health systems, and society at large.

The consequences of delayed and inequitable diagnosis are particularly severe in rural America. Rural populations are older on average, are aging more rapidly, and face shrinking caregiving workforces—factors that increase both the risk and impact of Alzheimer's disease. Yet, these communities frequently lack access to specialized clinicians and diagnostic infrastructure—such as positron emission topography (PET) imaging and advanced biomarker testing—that increasingly define the standard of Alzheimer's care. As a result, rural residents are more likely to be diagnosed later, underdiagnosed entirely, or geographically excluded from access to emerging therapies and clinical trials. Addressing Alzheimer's disease therefore requires not only advancements in biomedical science but also policy action to modernize diagnostic pathways and expand access to scalable, accessible detection tools deployable within primary care settings—particularly for underserved rural populations.

Status and Prevalence of Alzheimer's Disease

Due to an aging population, America is facing an unprecedented Alzheimer's crisis. As of the most recent statistics, published in 2024, more than 6 million Americans are living with Alzheimer's disease, and some projections suggest that this number could more than double to nearly 14 million by 2060.[1] Alzheimer's is currently the seventh-leading cause of death in the United States, underscoring both its clinical severity and its growing public-health impact.[2]

The number of people with Alzheimer's disease increased drastically from 1990 to 2019, more than doubling from 2.88 million to 6 million, largely reflecting population aging and longer life expectancy—a testament to the strengths of the U.S. health-care system. Yet, despite more than a century of research since Alzheimer's disease was first described in 1910, patients still wait an average of three years from symptom onset to formal diagnosis.[3]

Furthermore, disability-adjusted life years (DALYs) due to Alzheimer's disease have more than doubled since 2000, increasing from 11.8 million to 32.6 million. DALYs represent the number of healthy years of life lost due to disability and are among the most widely used indicators of disease burden. This dramatic increase underscores the persistent and growing impact of Alzheimer's disease on both lifespan and quality of life.[4] Consequently, delays and inefficiencies in diagnosis remain important challenges in Alzheimer's care.

The consequences of delayed diagnosis extend far beyond patients themselves. Alzheimer's imposes a substantial burden on caregivers, health systems, and the broader economy. The outward symptoms of Alzheimer's—such as memory loss, confusion, and emotional dysregulation—are often referred to as dementia. Global dementia-related costs are projected to reach $2 trillion in 2030. In the United States alone, per-patient costs are substantial: in 2016, formal care costs were $28,078 per patient, while the costs for informal caregiving, when relatives

care for patients free of charge, continue to add $36,667 in replacement costs and $15,792 in forgone wages each year. Analysts estimate total formal (paid) care costs to be $196 billion per year. When the economic value of unpaid family caregiving is included, total annual costs rise to between $305 billion (based on caregivers' forgone wages) and $450 billion (based on the cost of hiring professional replacement care).[5] Taken together, these costs amount to hundreds of billions of dollars annually. Addressing Alzheimer's is therefore not only a clinical imperative, but also an economic one.

The challenges are particularly acute in rural communities. Rural populations are older on average, experience higher rates of disability, and are aging faster than urban populations—factors that increase Alzheimer's risk and severity.[6] Yet, rural areas often lack access to traditional diagnostic infrastructure, such as PET imaging and lumbar punctures, performed by specialists. Less access leads to diagnostic delays and poorer patient outcomes.[7] Improving early detection in rural settings is therefore essential to reducing health inequities.

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Policymakers should prioritize research, validation, and deployment of accessible diagnostic tools, including blood-based biomarker (BBM) tests and digital cognitive screening technologies, to facilitate their greater access across the nation. Portable, scalable diagnostics could meaningfully reduce diagnostic delays, lower costs, and improve outcomes—particularly for underserved rural populations. Without decisive action to modernize Alzheimer's detection and care, the clinical and economic burden of the disease will continue to grow unchecked.

Alzheimer's Pathology: Brief Overview

Alzheimer's disease is a progressive neurodegenerative disorder traditionally characterized by the abnormal accumulation of misfolded proteins in the brain. The most well-known of these is amyloid beta, which forms plaques derived from amyloid precursor protein (APP). These plaques accumulate primarily in brain regions critical for memory and cognition, including the hippocampus and cerebral cortex, and are associated with neuronal dysfunction.[8]

Genetic factors play an important role in Alzheimer's risk, particularly in rare familial forms of the disease. Mutations in genes involved in amyloid processing—such as APP and presenilin (PSEN1)—can accelerate plaque formation; notably, individuals with Down syndrome, who carry an extra copy of the APP gene, leading to overexpression of that APP gene, face a significantly increased risk of early-onset Alzheimer's.[9]

In the more common sporadic form of Alzheimer's disease, the APOE4 genetic variant substantially increases risk by impairing lipid metabolism and promoting neuroinflammation.[10] Together, these pathways highlight shared biological mechanisms underlying disease onset.

In addition to amyloid pathology, Alzheimer's is associated with widespread neuronal dysfunction, particularly affecting cholinergic neurons, which are essential for memory and cognitive processing. Loss of these neurons and reduced acetylcholine signaling contribute to the progressive cognitive decline observed in patients and form the basis for several existing symptomatic treatments.[11]

Importantly, growing evidence suggests that amyloid accumulation alone does not fully explain disease progression. Many cognitively normal older adults exhibit high amyloid burden without developing dementia, and amyloid levels correlate poorly with the severity of cognitive impairment. By contrast, the accumulation of tau protein tangles, which form inside neurons, tracks much more closely with disease severity and cognitive decline.[12] Neuroinflammation further amplifies neuronal injury and progression.

As a result, Alzheimer's is increasingly understood as a multifactorial disease in which amyloid dysfunction may initiate pathology, but tau aggregation and inflammation drive clinical progression. This evolving understanding has direct implications for diagnosis. Current clinical standards emphasize detection of both amyloid and tau pathology—most commonly through PET imaging—to support accurate diagnosis and staging of the disease.[13]

CHALLENGES IN RURAL AMERICA

Rural Aging Trends

Rural communities are older on average and have faster-growing elderly populations.[14] This demographic profile naturally increases the burden of Alzheimer's disease and makes early detection even more important. Because Alzheimer's prevalence rises steeply with age, even small differences in age structure can translate into disproportionately large differences in disease burden.

According to U.S. Census Data, more than 20 percent of rural residents are aged 65 years or older, compared with 16 percent of urban residents.[15] In some states, over half of older residents live in rural areas. Moreover, not only are current rural populations significantly older than their urban counterparts, but the number of elderly residents in rural areas is also growing more rapidly than in metropolitan areas. Data from the U.S. Department of Agriculture shows that the number of rural residents aged 65 and over increased from 7.4 million in 2010 to 9.7 million in 2023.[16] This trend is driven by longer life expectancy, declining birth rates, and the appeal of rural areas as retirement destinations.

The diagnostic prevalence of Alzheimer's disease is 11 percent lower in rural counties than in urban counties, suggesting significant underdiagnosis or diagnosis at later stages of dementia.

At the same time, rural areas experience faster out-migration of younger adults, significantly reducing the local caregiving base. While the older rural population grew substantially between 2010 and 2023, the working-age population declined from more than 30 million in 2010 to 28 million in 2023.[17] This demographic imbalance results in higher dependency ratios. Dependency ratios measure the number of older dependents per 100 working-age individuals; higher ratios indicate greater caregiving demand. Rural areas have an average dependency ratio of approximately 40, signaling substantial caregiving needs.[18] In practice, this means fewer available family caregivers, greater strain on informal care networks, and increased reliance on already limited formal care services. Moreover, these needs are increasingly unlikely to be met locally as the working-age population continues to decline, further exacerbating the burden of Alzheimer's disease in rural communities.

Shortage of Specialists and Resources

Rural areas face multiple barriers to timely Alzheimer's diagnosis and care, including limited access to neurologists and memory care specialists, sparse diagnostic infrastructure such as PET scanners, and fewer clinics with specialized cognitive screening capabilities. Recent studies indicate that the diagnostic prevalence of Alzheimer's disease is 11 percent lower in rural counties than in urban counties, suggesting significant underdiagnosis, or diagnosis at later stages of dementia.[19]

Approximately 60 percent of rural residents aged 65 and older live in areas with limited access to neurologists and memory care specialists.[20] In a study conducted in Washington state, the mean distance to the nearest neurologist was 17 miles, compared with 4 miles for primary care physicians. Yet, residents of small towns and rural areas have to travel 2.12 to 4.01 times farther to reach the nearest neurologist, and 1.14 to 3.32 times farther to reach the nearest primary care physician than do their urban counterparts.[21] Primary care physicians play a critical role in Alzheimer's care, as they are typically the first point of contact for identifying cognitive decline and initiating diagnostic evaluation or referral to neurology.

Approximately 60 percent of rural residents aged 65 and older live in areas with limited access to neurologists and memory care specialists.

Neurologists are essential for both diagnosis and ongoing disease management. However, 71 percent of physicians in rural areas report that there are insufficient dementia specialists to meet demand, compared with 44 percent of physicians in urban areas.[22] Increased travel distances to access these providers not only delay diagnosis and limit treatment options, but may also increase anxiety and agitation among patients with Alzheimer's disease, potentially worsening symptoms. These distance-related barriers are particularly challenging for older adults who may no longer drive and rely on family members for transportation. In rural settings, caregivers often face additional socioeconomic constraints, including lack of access to a vehicle or the financial resources needed for fuel.[23]

Collectively, these factors contribute to missed or delayed diagnoses of Alzheimer's, further exacerbating the burden of the disease. Delayed diagnoses limit patients' ability to benefit from emerging disease-modifying therapies, which are most effective earlier in the disease course, as well as from opportunities for early intervention, care planning, and clinical trial participation.

Lack of Diagnostic Infrastructure

Even when patients can access clinicians, rural facilities are more likely to lack the diagnostic infrastructure required for accurate Alzheimer's detection. These disparities are especially pronounced for advanced imaging technologies such as PET. PET scanners rely on radioactive isotopes that must be produced in cyclotron or radionuclide generator facilities and transported to imaging centers.[24] Because these isotopes have short half-lives and some can expire within hours, geographic distance and logistical complexity further constrain access in rural settings. As a result, rural patients are systematically less likely to receive PET-confirmed Alzheimer's diagnoses—which increasingly underpin treatment eligibility and trial participation—reinforcing disparities in both clinical care and access to innovation.[25]

Elevated Risk Factors

Rural U.S. adults face a disproportionately high burden of modifiable dementia risk factors, particularly cardiometabolic disease and sensory issues. According to The Lancet Group, approximately 45 percent of dementia cases are attributable to modifiable risk factors.[26] These risks accumulate across one's life course to contribute to dementia risk and include early-life educational disadvantage and late-life social isolation. Middle-aged adults bear the greatest overall burden of modifiable risk factors, including depression, traumatic brain injury, hearing loss, obesity, high cholesterol, and physical inactivity. In rural communities, cardiometabolic disease and sensory impairment are especially prevalent.

Rural residents are 11 percent more likely to have hypertension, 22 percent more likely to be obese, and 29 percent more likely to have diabetes than their urban counterparts, even after accounting for demographic, health-care-access, and socioeconomic differences.[27] These conditions represent well-established contributors to Alzheimer's disease and related dementias, in part by damaging blood vessels, reducing oxygen and nutrient supply to the brain, increasing inflammation, and causing oxidative stress, which is an excess of chemically reactive forms of oxygen in the blood.[28] Poor cardiovascular health limits blood flow and oxygen delivery to the brain, accelerating the buildup of plaques—such as amyloid beta and tau—which in turn exacerbates cognitive decline, increasing vulnerability to neurodegenerative disease.

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Sensory loss further compounds dementia risk in rural areas. Adults living in rural communities are approximately 22 percent more likely to suffer from hearing loss, likely reflecting higher rates of occupational noise exposure from agricultural and industrial work, such as tractors and power tools.[29] Hearing loss alone may account for up to 9 percent of dementia cases.[30] While the link between hearing loss and dementia is complex, scientists theorize that hearing loss causes both social isolation and increased cognitive load, which both contribute to the risk of disease.[31] Taken together, the elevated prevalence of modifiable risk factors in rural communities underscores the importance of targeted prevention strategies as part of a comprehensive Alzheimer's policy response.

ECONOMIC BURDEN OF ALZHEIMER'S IN RURAL AREAS

Delayed diagnosis of Alzheimer's disease in rural communities not only worsens patient outcomes, but also imposes high economic costs on the health-care system, families, and the broader economy. Without access to early detection and specialist care, patients are more likely to present at later stages of the disease when care needs are more intensive and costly. As a result, delayed diagnosis is associated with higher health system expenditures, increased Medicare and Medicaid spending, greater caregiver burden, and reduced workforce participation among both patients and family caregivers. Importantly, these economic consequences extend beyond health-care spending, affecting family finances and local labor markets in already resource-constrained rural communities.

Health System Costs

The economic burden of Alzheimer's disease is already significant and is projected to grow sharply in the coming decades. Total payments for health care, long-term care, and hospice services for people living with dementia are expected to approach $1 trillion in 2050.[32] As of 2020, estimated total health-care costs attributable to Alzheimer's disease were approximately $232 billion, with most direct expenditures driven by skilled nursing care, formal home health care, and hospice care.[33]

Alzheimer's disease is also associated with substantially higher acute care costs. Hospitalizations for patients with Alzheimer's disease are, on average, $2,794 more expensive per visit than hospitalizations for patients without dementia, reflecting greater clinical complexity and increased need for post-discharge follow-up care.[34] In addition, individuals living with Alzheimer's disease or related dementias experience approximately twice as many hospital stays per year as other older adults do, further increasing strain on the health-care system.[35]

These cost pressures are likely exacerbated in rural areas, where populations are older on average and access to dementia specialists and coordinated care is more limited. Earlier diagnosis and intervention offer a potential pathway to reducing health-care and long-term-care costs by slowing disease progression, improving care planning, and avoiding preventable hospitalizations.

Reduced Labor Force Participation

Alzheimer's disease further affects rural economies through its impact on the workforce, particularly via the need for unpaid family caregivers. Older adults living in rural areas are disproportionately more likely to receive care from family members than are those in urban areas, meaning many caregivers were previously active participants in the workforce. Rural adults are 13 percent more likely to receive care from a family member than are their urban counterparts due to a lack of professional caregivers in rural areas.[36] Because caregiving responsibilities often arise suddenly and intensify over time, many family members are forced to make rapid and unplanned adjustments to their employment.

The workforce consequences of caregiving are substantial: 18 percent of caregivers reduce their employment from full-time to part-time, 9 percent leave the workforce entirely, and 6 percent retire early.[37] These losses disproportionately affect working-age adults during their peak earning years, amplifying long-term economic consequences for households and communities.

These effects are especially pronounced in rural communities. According to the Centers for Disease Control and Prevention (CDC), approximately one in five healthy adults in rural areas serve as a caregiver, and 20 percent of these individuals care for someone with Alzheimer's disease.[38] In rural settings with smaller labor pools—averaging 6 percent smaller than comparable urban areas—even modest reductions in workforce participation can have outsized effects on local employers and essential services.[39]

A heavier reliance on family-member caregivers reflects, in part, the more limited economic and care infrastructure in rural areas, including fewer formal long-term care options. As a result, caregiving obligations in rural areas are less likely to be offset by paid services or institutional care. Economic vulnerability further compounds these challenges. Per capita income in rural areas is approximately $9,000 lower than the national average, and rural residents are more likely to live below the poverty line.[40] As more working-age adults reduce hours or exit the labor force to

provide care, rural economies face additional strain. Over time, caregiving-driven workforce losses reduce household income, limit economic mobility, and shrink the local tax base.

Impact on Caregivers

Beyond health system costs and reduced labor force participation, caregiving for individuals with Alzheimer's disease imposes substantial financial burdens on caregivers themselves. These costs affect both informal caregivers who forgo wages to care for family members and those who rely on formal care services. As of 2016, the estimated annual per-patient cost of formal dementia care was $28,078. The current economic value of informal care—measured through replacement costs and forgone wages—has been estimated at $36,667 and $15,792, respectively. The total lifetime cost of care for a person living with dementia is estimated at $405,262.[41] For many caregivers, these expenses coincide with reduced income or job loss, compounding financial strain at precisely the moment when care needs are escalating.

Patients with Alzheimer's disease incur, on average, at least $18,000 more in health-care costs than do individuals without Alzheimer's disease during the eight years preceding death and the year of death itself. Notably, approximately 70 percent of these costs are borne by family caregivers through unpaid caregiving and out-of-pocket expenses.[42] These financial pressures are particularly pronounced in rural areas, where caregivers are approximately 23 percent more likely to experience significant financial strain than are their urban counterparts.[43] Because rural caregivers tend to have fewer financial buffers and limited access to paid care alternatives, even modest increases in caregiving costs can have substantial effects on household finances.

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Caregiving also carries a substantial emotional toll, which is exacerbated in rural settings by financial stress and limited access to support services. More than two-thirds of rural caregivers report experiencing social loneliness, often due to geographic isolation and distance from friends, family, and formal support networks.[44] At the same time, chronic underinvestment in rural health-care infrastructure has contributed to limited availability and lower quality of long-term care services, making it more difficult for caregivers to access professional support, training, and respite care when needed.[45] Limited availability of mental health services in rural areas further constrains caregivers' ability to manage stress, depression, and anxiety associated with long-term caregiving responsibilities.[46]

As a result of these cumulative pressures, 65 percent of rural caregivers report moderate to severe anxiety symptoms in a study conducted in rural Canada.[47] One caregiver described the experience as follows:

> I need help for myself. I've gained weight and become more ill caring for others. But I live in a rural area with not a lot of options. For much of my life, I feel invisible. I know there are some ways I could get more help but that feels like an extra job for which I just don't have time or energy.[48]

This testimony reflects a broader pattern of unmet caregiver needs in rural communities, where support services are often fragmented, can be distant, and for many are unaffordable.

These financial and emotional burdens can contribute to reduced workforce participation, leading to lost wages and diminished economic stability for both households and communities. Addressing Alzheimer's disease in rural areas is therefore essential not only for improving patient outcomes, but also for supporting caregivers and sustaining a stable, healthy workforce. Without targeted caregiver support policies, these burdens will continue to erode rural economic resilience and workforce participation.

Heavy Reliance on Public Payers

Rural patients rely more heavily on Medicare, Medicaid, and long-term services and support, shaping access to Alzheimer's diagnosis and treatment. Rural counties have higher Medicaid enrollment rates among older adults, and delayed diagnosis often leads to greater reliance on institutional care.[49] Earlier detection and intervention therefore represent an opportunity to reduce downstream spending, particularly on high-cost long-term care services, as these cost pressures have implications for both state budgets, especially in rural-heavy states, and federal budgets.

Alzheimer's disease and related dementias account for a disproportionate share of Medicare and Medicaid expenditures. Of the approximately $232 billion in total medical and long-term care costs associated with Alzheimer's disease, $106 billion is paid by Medicare and $58 billion by Medicaid, while $52 billion is paid out of pocket by individuals and families and $16 billion by other payers, including private health insurance.[50] On a per-person basis, Medicare spends over $22,000 annually on individuals living with Alzheimer's disease and other dementias, compared with approximately $8,000 for beneficiaries without these conditions.[51] Nearly one in five Medicare dollars are currently spent on individuals diagnosed with Alzheimer's or related dementias, a share projected to rise to one in three Medicare dollars by 2050.[52] This concentration of spending underscores the importance of interventions that can delay disease progression and reduce avoidable high-cost care. Medicaid expenditures follow a similar pattern. For individuals living with dementia, Medicaid costs are 22 times higher than for older adults without dementia, while Medicare costs are approximately three times higher.[53]

Rural communities face amplified exposure to these public payer costs. Rural residents are 14 percent more likely to rely on Medicare and Medicaid than are their urban counterparts, and approximately 22 percent of older adults are dually enrolled in both programs.[54] In six states, more than half of Medicaid enrollees reside in rural areas.[55] This elevated dependence on public insurance, combined with older population demographics, magnifies the fiscal impact of Alzheimer's disease on rural health-care systems and state Medicaid programs. Without targeted interventions, these pressures are likely to intensify as rural populations continue to age.

For communities facing these disproportionate burdens, scalable diagnostic innovations—such as digital cognitive assessments and BBM tests—offer more accessible alternatives to traditional diagnostic pathways. By expanding access to timely diagnosis and treatment, these tools have the potential to reduce costs for patients, public payers, and rural health-care systems while improving care outcomes.

DIAGNOSTIC INNOVATIONS

Blood-Based Biomarkers

Recently approved by the U.S. Food and Drug Administration (FDA), blood-based Alzheimer's tests offer a less-invasive, accessible, and more-affordable alternative to traditional PET scans or lumbar

punctures. Because they rely on routine blood draws rather than advanced imaging or specialized procedures, these tests may be particularly well-suited for use in rural and resource-constrained clinical settings.

BBM tests detect Alzheimer's pathology by measuring ratios of pathological to nonpathological proteins circulating in blood plasma. These biomarkers reflect the same underlying disease processes traditionally identified through PET imaging or cerebrospinal fluid (CSF) analysis—namely amyloid-beta and tau pathology. Advances in assay sensitivity have made it possible to reliably measure specific protein isoforms in blood, including $A\beta_{42}/A\beta_{40,}$ both variants of amyloid beta, and phosphorylated tau species such as p-tau181, p-tau217, and p-tau231.[56]

These diagnostics represent a new generation of Alzheimer's testing. In 2025, two BBM tests received FDA approval for Alzheimer's diagnosis: The Lumipulse G β-Amyloid Ratio test, developed by Japanese company Fujirebio and approved in March 2025, detects amyloid pathology associated with Alzheimer's disease.[57] The Elecsys pTau181 plasma test, developed by Roche and approved in October 2025, measures tau-related neurodegeneration.[58]

In response to these approvals, the Global CEO Initiative on Alzheimer's Disease convened a workgroup to define minimum acceptable clinical performance standards for BBM tests. These standards focus on sensitivity and specificity, which are key measures of diagnostic accuracy. "Sensitivity" refers to a test's ability to correctly identify individuals with Alzheimer's disease, while "specificity" reflects its ability to correctly identify individuals without the disease. The workgroup concluded that tests with at least 90 percent sensitivity and 75 percent specificity could be used as triage tools, in which a negative result reliably rules out Alzheimer's pathology but a positive result *requires* confirmatory testing through PET imaging or CSF analysis. By contrast, BBM tests with at least 90 percent sensitivity and 90 percent specificity could potentially serve as substitutes for PET or CSF-based diagnostics.[59]

On a per-person basis, Medicare spends over $22,000 annually on individuals living with Alzheimer's disease and other dementias, compared with approximately $8,000 for those without these conditions.

Evidence suggests that most currently available and near-term BBM tests achieve high sensitivity—generally in the range of 86 to 92 percent—but lower specificity, often below the 90 percent threshold.[60] As a result, these tests are better suited for ruling out Alzheimer's disease than for definitively ruling it in, reinforcing the continued need for confirmatory testing following positive results. While negative results can help avoid unnecessary and costly downstream testing, false positives may increase demand for confirmatory testing. Accordingly, the evidence supports the use of BBMs primarily as triage tools within a stepwise diagnostic pathway rather than as standalone diagnostic substitutes.

Despite these limitations, BBMs represent a promising advance in Alzheimer's diagnostics. Compared with PET imaging, they are far more portable and substantially less expensive: while Medicare reimbursement for a PET and imaging agent is more than $4,700, Medicare reimbursement for blood-based tests is set at about $130.[61] Additionally, using BBMs for triage testing within a stepwise diagnostic pathway could lower the average cost per diagnosis compared with a PET scan alone—$8,868 versus $10,345 per PET-only diagnosis.[62]

As assay performance improves, these tools may play an increasingly important role in expanding diagnostic access, particularly in rural areas, by offering a lower-cost, noninvasive, and scalable option in the Alzheimer's disease diagnostic pathway. Currently, there are no BBM tests approved by public or private insurers. To maximize their benefits, the integration of BBMs into clinical practice will require clear guidance on appropriate use, reimbursement alignment, and defined referral pathways—particularly in rural settings where follow-up resources are more limited.

Digital Screening Tools

A key barrier to efficient Alzheimer's diagnoses in rural areas is the lack of dementia and memory care specialists. Without specialized training, Alzheimer's disease and its associated cognitive symptoms can be difficult to detect. However, app-based cognitive assessments and digital screening tools can be administered by nonspecialists and integrated into telehealth workflows. These tools enable scalable early detection and monitoring, even in settings with limited clinical staff.

These digital-based assessments typically come in the form of smartphone apps, allowing testing to be conducted either in clinical settings or at home, relieving the burden of traveling long distances for care. Currently, numerous commercial cognitive screening tools exist, including ones available on Apple's App Store such as BrainTest, BrainCheck, neoTiv, and NIH Toolbox. Other software platforms, such as Lenus Health and Creyus, offer apps specifically for clinicians for diagnostic purposes. These apps are designed to test for and detect mild cognitive impairment (MCI), which is one of the earliest clinical signs of Alzheimer's disease. To assess MCI, these apps usually present a series of game-like tasks to evaluate memory, attention, and executive function.[63] These tasks take various forms, such as card-sorting exercises, picture-based memory tests, and pattern-comparison tasks, while also accounting for demographic factors, such as education.

The creators of NIH Toolbox claim that the platform can detect early warning signs of dementia in under 30 minutes.[64] Once testing is completed, users of NIH Toolbox and BrainTest can send their results to specialists and receive professional feedback. These apps are also particularly useful for tracking cognitive changes over time, as assessments can be easily repeated at regular intervals, enabling longitudinal monitoring.

More advanced digital tools are currently undergoing evaluation in clinical trials. These applications are specifically designed to predict whether a patient has an elevated amyloid-beta load based on cognitive assessment and perceived memory impairment. In one study, researchers used the Mobile Monitoring of Cognitive Change (M2C2) app to administer at-home assessments and found that one task—the Price task—demonstrated strong accuracy in distinguishing amyloid-beta-positive from amyloid-beta-negative individuals, as confirmed by PET imaging.[65] The task simulates a real-world grocery shopping scenario, requiring participants to manage a budget, avoid overspending, and accurately calculate payment. Lower task performance was associated with amyloid-beta positivity, with classification accuracy of approximately 75 percent. These results were comparable to in-person, specialist-administered assessments. For example, the TabCAT Favorites task, an established in-person short-term memory assessment, demonstrated similar accuracy in distinguishing amyloid-beta status.[66] In a related study, lower scores on the online Brain Health Assessment were also significantly correlated with higher amyloid-beta levels *and* regional tau burden.[67]

When combined with BBMs and tele-neurology consultations, digital screening tools could serve as the first step in a tiered diagnostic pathway, reserving specialist visits and advanced imaging for patients most likely to benefit.

Together, these findings underscore the promise of digital cognitive screening tools—particularly for rural and underserved populations—by providing low-cost, accessible, and scalable options for early detection and ongoing cognitive monitoring. While these tools are not intended to replace comprehensive clinical evaluation, they can play an important supporting role in early screening and triage, especially in areas where specialist access is limited. By enabling task shifting from specialists to primary care or trained nonspecialists, digital screening tools can partially mitigate workforce shortages in rural health systems and improve the allocation of scarce clinical expertise.

When combined with BBMs and tele-neurology consultations, digital screening tools could serve as the first step in a tiered diagnostic pathway, reserving specialist visits and advanced imaging for patients most likely to benefit. However, clear reimbursement pathways and guidance on appropriate clinical use will be critical to support adoption and effective integration of these tools in rural health-care settings.

Artificial Intelligence

As BBMs and remote cognitive screening tools gain clinical relevance, it is also important to consider the application of emerging technologies, such as artificial intelligence (AI), in Alzheimer's detection. AI-enabled diagnostics have the potential to play a complementary role in screening and risk stratification, particularly for identifying individuals at elevated risk earlier in the disease course.

Many AI-based diagnostic tools rely on multimodal computational frameworks that integrate diverse sources of patient data collected over time. These models draw on inputs such as neuroimaging scans, family history, prior medical diagnoses, cognitive assessments, and genetic information and compare individual-level patterns with large reference datasets that include both patients who have developed Alzheimer's disease and those who have not. Based on these comparisons, AI models generate individual risk estimates indicating the likelihood of future disease onset.

Recent studies published in *Nature Neuroscience* suggest that certain AI models can predict Alzheimer's disease risk with approximately 68 percent accuracy as many as seven years before clinical onset, using longitudinal health-care data, family history, and imaging information.[68] More advanced models have demonstrated the ability to predict the presence and location of amyloid and tau pathology, with reported accuracies of roughly 75 percent for amyloid and 80 percent for tau, based on similar multimodal inputs.[69]

At present, AI-based diagnostics have not been approved by the FDA as standalone tools for diagnosing Alzheimer's disease. However, one AI tool, BrainSee, has received FDA clearance as an adjunctive tool intended to support, but not replace, clinical judgment. BrainSee generates risk assessments using demographic data, cognitive screening results, and MRI scans. Although this approach still requires access to MRI imaging, it avoids reliance on PET scans, which are substantially scarcer in rural areas due to infrastructure requirements and the need for radioactive isotopes.[70]

While AI-based diagnostics remain limited in scope and are best viewed as decision-support tools rather than definitive diagnostic instruments, they may nonetheless play an important complementary role when integrated with BBMs and digital cognitive assessments. In combination, these technologies could support earlier risk stratification and more efficient triage, helping to prioritize specialist referrals and advanced imaging for patients most likely to benefit—an especially important consideration in rural settings with constrained clinical resources.

Treatment Implications

Earlier identification of Alzheimer's disease carries significant clinical and economic benefits, even in the absence of curative therapies. Timely diagnosis enables patients and families to plan for future care needs, access supportive services sooner, and make informed financial and legal decisions. Clinically, early detection improves management of comorbidities, reduces avoidable hospitalizations, and supports safer medication use. At the system level, earlier and more accurate diagnosis can help allocate specialist care and advanced diagnostics more efficiently—particularly in rural and underserved areas with limited clinical capacity.

Early diagnosis has become increasingly consequential as disease-modifying therapies emerge. In 2023 and 2024, the FDA approved two monoclonal antibodies for the treatment of early Alzheimer's disease, but eligibility is tightly constrained. LEQEMBI (lecanemab), approved in January 2023, and Kisunla (donamenab), approved in July 2024, are indicated only for patients with MCI or mild dementia with elevated levels of beta-amyloid in the brain confirmed through PET imaging. The drugs target amyloid-beta aggregates in the brain, reducing plaque burden associated with disease progression.[71]

In clinical trials, LEQEMBI slowed cognitive decline by 27 percent over 18 months compared with placebo, corresponding to approximately five months of preserved cognitive function.[72] Meanwhile, Kisunla slowed decline by up to 35 percent at 18 months.[73] Both require biomarker confirmation and are most effective in the earliest stages of disease.

Because amyloid-targeting therapies are generally ineffective once neurodegeneration has advanced, regulatory approval is limited to early-stage patients.[74] As next-generation treatments under development—including ACU193, now entering Phase II trials—continue to target early pathological changes, their clinical value will depend on the availability of accurate and scalable diagnostic tools.[75] Expanding access to BBMs and digital cognitive screening tools can broaden treatment eligibility, reduce reliance on costly and capacity-constrained imaging, and extend the benefits of emerging therapies to rural and underserved communities.

POLICY RECOMMENDATIONS

The disproportionate burden of Alzheimer's risk factors, diagnostic barriers, and health system costs in rural communities underscores the need for targeted policy actions. Addressing Alzheimer's disease—particularly in rural areas—requires progress along three interconnected pillars: access, education, and funding. Each depends heavily on national-level policymaking, especially through congressional action that determines Medicare coverage and federal research investment. The following policy initiatives have the potential to meaningfully reduce diagnostic delays and disease burden in rural populations.

Expand Diagnostic Access

A critical barrier to earlier Alzheimer's diagnosis in rural communities is the lack of consistent coverage for emerging diagnostic tools. Medicare does not cover blood tests as screening tools for Alzheimer's disease, which are now emerging for use in people with Alzheimer's disease biomarkers but who are not yet cognitively impaired. Cognitive assessments furnished by a clinician as part of the Annual Wellness Visit are generally covered by Medicare, but coverage of fully remote, stand-alone digital screenings remains limited and inconsistent.

The most relevant legislative proposal addressing the lack of coverage for BBM tests as screening tools is H.R. 6130, the Alzheimer's Screening and Prevention (ASAP) Act.[76] The ASAP Act would amend Title XVIII of the Social Security Act to formally recognize FDA-cleared or approved biospecimen-based tests—including BBMs—as covered Medicare services for the early detection of Alzheimer's disease and related dementias.[77] Introduced in the 2025–2026 Congress with bipartisan support, the bill has been referred to the House Committees on Energy and Commerce and Ways and Means.

If enacted, the ASAP Act would significantly improve equitable access to early diagnostic testing in rural areas, where reliance on Medicare is higher and access to specialty imaging such as PET scans is limited.

However, important gaps remain. While legislation has been introduced to address blood-based diagnostics, no comparable proposal currently exists to standardize Medicare reimbursement for digital cognitive assessments. Despite their potential to reach patients remotely, these tools can be costly and inconsistently reimbursed. For example, some FDA-cleared digital assessments require subscription fees ranging from modest monthly costs to several hundred dollars annually. Medicare reimbursement is often limited to assessments administered in person or via telehealth for a minimum duration and interpreted by a clinician under specific CPT (Current Procedural Terminologies) code CPT 96136—requirements that introduce complexity and limit scalability in rural settings.[78]

Although certain digital assessments can be prescribed for remote use and reimbursed when paired with a follow-up clinical visit, this fragmented and opaque reimbursement framework creates additional barriers to timely diagnosis. For rural providers and patients, uncertainty about whether a diagnostic tool will be reimbursed can be as restrictive as lack of coverage itself. To address this challenge, federal regulators should streamline early diagnosis, especially by primary care providers, by introducing a new CPT code that does not include the time requirements of CPT 96136 and is not paired with follow-up codes. This would create ideal conditions for providers, especially those in primary care, to use digital cognitive screening tools to identify individuals with early symptoms of Alzheimer's disease.

Strengthen the Rural Health Workforce

Rural areas face a significant lack of access to dementia care specialists and neurologists. In approximately 85 percent of Alzheimer's cases nationwide, the initial diagnosis is made by nondementia specialists—typically primary care providers. This percentage is likely even higher in rural areas due to the severe shortage of neurologists. However, most primary care physicians report that they do not feel adequately prepared to provide ongoing dementia care, as they lack specialized training. Strengthening the rural health workforce through enhanced education and

training of primary care physicians should therefore be a priority in improving Alzheimer's diagnosis and care in rural areas.

One potential policy solution is H.R. 3747, the Accelerating Access to Dementia & Alzheimer's Provider Training (AADAPT) Act, a bipartisan bill introduced in the 119th Congress. The AADAPT Act seeks to improve dementia care and early diagnosis by funding virtual training programs for primary care providers.[79] The legislation would authorize annual grants to support free continuing education programs for primary care providers focused on dementia diagnosis and long-term management. As these programs would be completely virtual, they would significantly expand access for rural health-care providers, who often face geographic and time constraints in pursuing additional training.

However, even with improved support for primary physicians, addressing the shortage of specialists in rural areas remains critical. The limited availability of neurologists in rural health systems constrains patient access and contributes to substantial delays in diagnosis. Advanced diagnostic technologies—including neuroimaging and biomarker testing—cannot be fully utilized without specialists trained to interpret results and guide treatment decisions.[80] Policymakers must address the structural causes of this shortage. Rural physicians typically care for older and sicker populations, often with less professional support and more limited access to infrastructure. In addition, physicians are far more likely to practice near where they complete their residency training, yet fewer than 1 percent of residency programs are located in rural areas.[81] At its core, this challenge reflects chronic underinvestment in rural health systems, which perpetuate specialist shortages. Addressing these funding gaps is essential to improving Alzheimer's care in rural communities.

In addition to strengthening the clinical workforce, solutions to the rural health crisis should also prioritize support for at-home caregivers, who are frequently overlooked in policy discussions. In rural communities, caregivers are often family members who have no choice but to reduce their work hours or leave full-time employment to provide care. This loss of income can create financial strain that limits access to health-care services for both the patient and the caregiver, compounding the burden of Alzheimer's disease.

One step policymakers can take is to improve awareness of existing financial supports. Rural caregivers may qualify for federal tax benefits such as the Credit for Other Dependents and the Child and Dependent Care Credit. The Credit for Other Dependents provides up to a $500 tax credit for qualifying caregivers who are supporting elderly family members, while The Child and Dependent Care Credit allows one to claim up to a $1,000 tax credit for working individuals who pay for the care of a child under 13 or a disabled dependent while working or looking for work.[82] Although these programs already exist, awareness remains limited. Increasing public knowledge of these benefits would be a relatively simple but meaningful way to support rural caregivers.

Another promising proposal is S. 3234, The Convenient Care for Caregivers Act in the 119th Congress. This bill would authorize a government pilot program allowing caregivers to receive support services at the same time and location as the patients they assist.[83] Grants would be provided to hospitals and senior centers to offer free or low-cost support services to caregivers, including health checkups, counseling, support groups, insurance assistance, and educational programming. For example, while a patient undergoes a cognitive evaluation, a caregiver could participate in counseling or a peer support session. By streamlining access to caregiver services, the

Convenient Care for Caregivers Act would reduce logistical burdens and strengthen the broader rural health support system.

Support Technology Adoption in Rural Hospitals

As technology advances—and as innovations in digital screening, AI, and telehealth offer new solutions to access barriers—it is important to ensure that these tools are themselves accessible. In rural areas in particular, digital inequities can create new barriers to care rather than alleviate existing ones.

Ensuring equitable patient access to diagnostic technologies requires that hospitals have the capacity to adopt and support these innovations. Yet rural hospitals face persistent financial strain: more than 48 percent operated at a loss in 2023.[84] Rural hospitals also lag behind urban hospitals in technology adoption.[85] Although BBM assays are relatively low cost compared with PET scans, their implementation requires staff training, updated IT systems, laboratory capacity, and quality control procedures. Advanced automated immunoassay analyzers—machines that measure specific biomarkers in blood—can cost up to $350,000 each.[86] While many rural hospitals already possess immunoassay equipment, these are often smaller or older models that cannot reliably analyze Alzheimer's blood-based biomarkers. In addition, necessary software upgrades may cost approximately $10,000.[87] Without support for these up-front investments, rural hospitals may be unable to integrate these innovations into routine clinical practice.

Legislation such as S. 474, the Fair Funding for Rural Hospitals Act, would establish a minimum funding allotment for hospitals serving a high share of Medicaid patients, many of which are located in rural communities. The act would allocate a minimum $20 million annually per state, potentially strengthening rural care systems.[88] Similarly, S. 335, the Rural Hospital Support Act, would increase Medicaid funding for approved testing and procedures in rural hospitals, helping support reimbursement for BBMs.[89] By strengthening funding and reimbursement mechanisms, such policies could help expand access to Alzheimer's diagnostics in rural communities.

CONCLUSION

Alzheimer's disease is reshaping the clinical and economic landscape of the United States—and rural communities are disproportionately affected. Older populations, workforce shortages, limited diagnostic infrastructure, and heavier reliance on public payers combine to magnify both the human and fiscal costs of delayed diagnosis. Yet some of the technological advances that are redefining Alzheimer's care—including BBMs and digital cognitive screening tools—offer a pathway to close longstanding diagnosis gaps. When deployed strategically, these innovations could help shift diagnosis earlier, allocate specialist resources more efficiently, and ensure that emerging therapies reach eligible patients before advanced decline occurs.

Realizing this opportunity will require deliberate policy action. Expanding Medicare coverage for diagnostic tools, strengthening the rural health workforce, investing in hospital infrastructure, and supporting family caregivers are mutually reinforcing pillars of a robust Alzheimer's strategy. By aligning innovation policy with rural health priorities, policymakers can reduce downstream costs, ease caregiver strain, and expand access to high-quality Alzheimer's care for millions of Americans beyond the reach of traditional specialty services.

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