



UsAgainstAlzheimer's

Place & Brain Health Equity:

Understanding the County-Level Impacts of Alzheimer's

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Executive Summary

Place & Brain Health Equity: Understanding the County-Level Impacts of Alzheimer's

The effects of where people live, and the social determinants of health are under-recognized and under-appreciated in our national response to effectively treat and prevent Alzheimer's. To better understand these issues, UsAgainstAlzheimer's and the Urban Institute analyzed the social determinants of health present in the counties most impacted by Alzheimer's among Latinos and Blacks in the Medicare program. This report found that deep social inequities exist in counties highly impacted by Alzheimer's among Latinos and Blacks

Key Finding: Counties with the highest prevalence of Alzheimer's among Blacks and Latinos are more likely to have worse social determinants of health compared to counties with the lowest prevalence of Alzheimer's among these communities. Key indicators included:

Percentage of families living in poverty



Median household income



Individuals under the age of 65 without health insurance



Percentage of individuals with access to exercise opportunities



Percentage of adults that have a bachelor's degree



Highest Prevalence Lowest Prevalence

Summary of Recommendations

The social determinants of health represent potential barriers to Alzheimer's public health interventions and research access that must be addressed and evidence suggest they may influence Alzheimer's risk. With further research and investment, a place-based framework that incorporates the social determinants of health could improve access to brain-health-related health services, research opportunities and public health interventions for under-resourced communities.

This report makes the following recommendations to promote place-based solutions to ADRD and to promote brain health equity:



Collect Representative Data and Data on the Social Determinants of Health: Scientists, government, and industry must contextualize Alzheimer's health data with social determinant data to tailor and target solutions where they are needed most. Too often, socioeconomic data and health data are not connected, which limits our understanding of the relationship between social conditions and Alzheimer's risk.



Invest in Community-Level Health Infrastructure: Under-resourced and high-risk communities must be able to access Alzheimer's health services and research where they live, not some place far away and difficult to get to. That means investing in community health centers and in the training of frontline health workers such as nurses and community health workers.

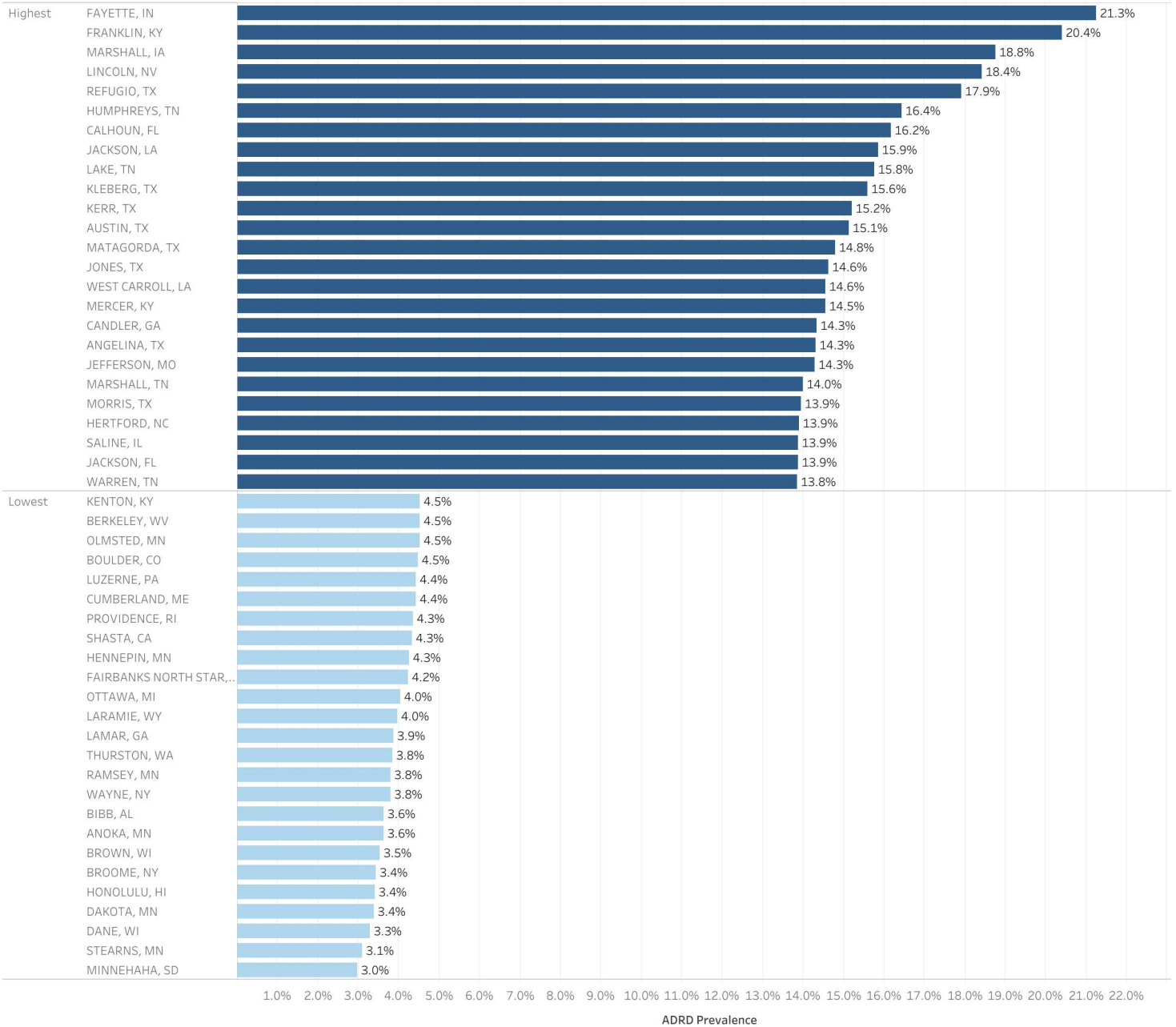


Invest in Communities to Reduce the Impact of Social Determinants: Governments and the healthcare industry must invest in efforts to address the social determinants of health at the local and national levels. Investing directly in communities and in social policies like paid family and medical leave can help repair the effects of systemic racism and discrimination.

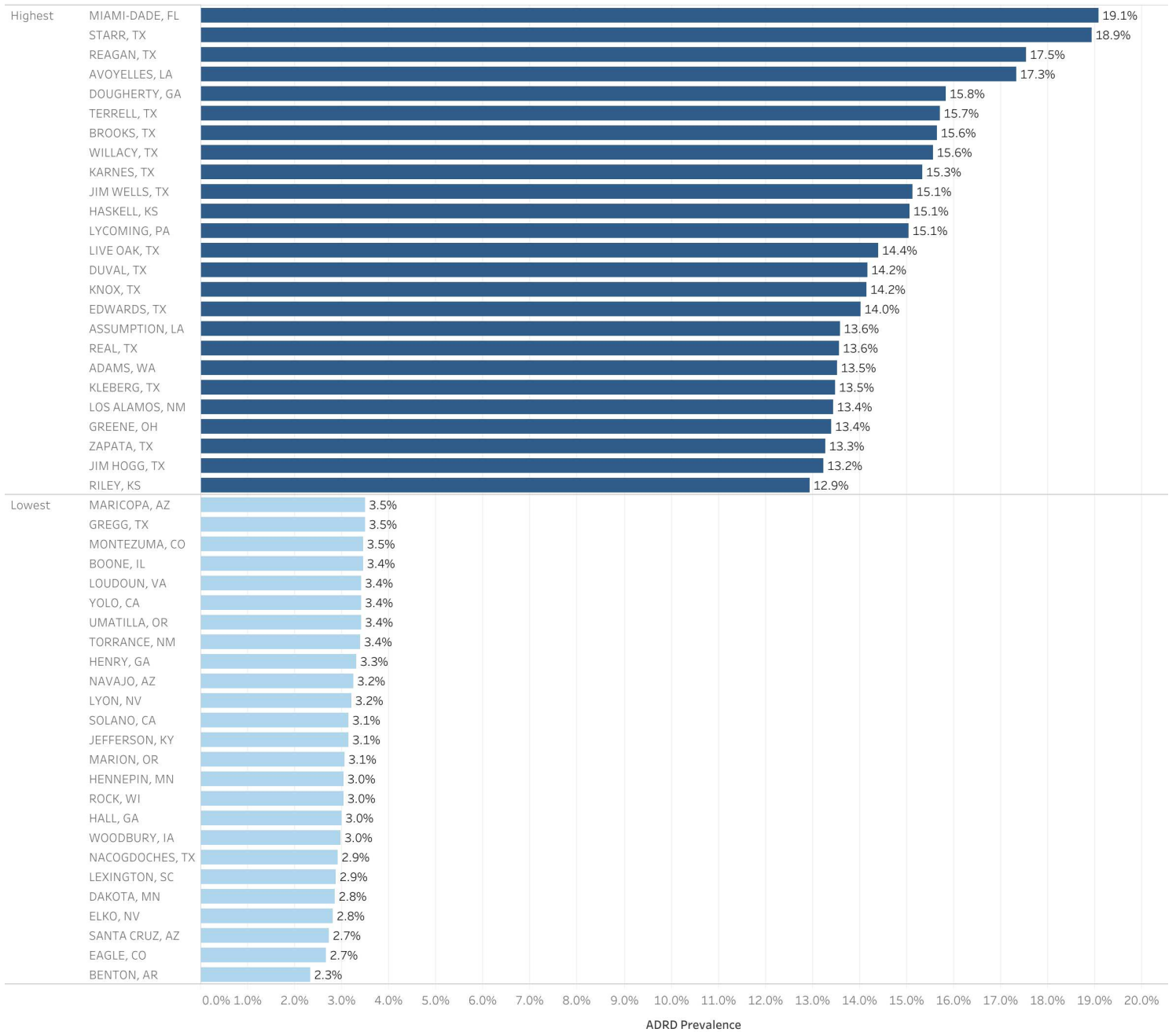


Set Aggressive Goals for Including Communities of Color in Research and Health Services: The Alzheimer's research community must be held to time bound goals for health equity and inclusion to ensure significant strides in research, intervention development, and treatments that are accessible to all communities.

25 Counties with the Highest and Lowest ADRD Prevalence Among Blacks (Medicare Fee for Service, 2016)



25 Counties with the Highest and Lowest ADRD Prevalence Among Latinos (Medicare Fee for Service, 2016)



About the Authors

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Stephanie Monroe, JD, is Executive Director of African Americans Against Alzheimer's, the first national network created specifically to respond to the disparate impact of Alzheimer's on African Americans. By working nationally, locally, and through strategic partnerships, African Americans Against Alzheimer's is raising awareness of the critical need to engage, connect, and mobilize to advance our national commitment to ending Alzheimer's by 2025. An attorney with decades of Legislative and Executive Branch experience, Stephanie served as Assistant Secretary of Education from 2005 until 2009. In that position, she was the Secretary of Education's primary adviser on civil rights issues and responsible for the Office for Civil Rights (OCR), a 600-person division in the U.S. Department of Education with twelve offices located across the United States.

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Foreword

As champions for civil rights, we have committed our lives to eliminating the health and economic disparities that plague our communities on the basis of racial, ethnic, and cultural differences. We also know that the conditions in which people are born, grow, work, live, and age – and the systems put in place to treat illness – are the most important social determinants of health.

Too many American families face health challenges because of barriers to education, the lack of economic mobility, and food insecurity. Along with disparities in the rates of diabetes, obesity, and hypertension, common precursors to Alzheimer’s disease, these barriers are limiting the longevity of millions of people. In addition, the health systems designed to mitigate these conditions often end up exacerbating them instead.

It must be our collective work as a nation to recognize the impact of these social determinants of health and design equitable and sustainable solutions to address them. Urgent action is needed to broaden our nation’s approach to reducing health inequities by addressing the social and structural conditions needed to promote good health and prosperity for all. This requires collaboration across a wide range of disciplines, sharing data, building a diverse and responsive workforce, and demanding that equitable access be embedded in policymaking, program development and research.


While these strategies have taken root in early childhood development and education, their importance in promoting healthy aging and in addressing chronic conditions such as Alzheimer’s, one of our nation’s most pressing health-equity challenges, has become increasingly apparent. Without appropriate interventions, our nation will see the number of individuals living with Alzheimer’s and related dementias increase from nearly 6 million today to 14 million by 2050. Even more significant, the higher risk of this progressive brain disease among Blacks and Latinos has placed these communities under increased economic strain and emotional hardship that is difficult to fully measure.

Accurate data are vitally important to understanding the impact of these disparities in order to guide solutions and measure progress. This report, which uses the National Alzheimer’s Disease Index™ as a key data source, offers a unique perspective on how geography and the social determinants of health impact the prevalence and effects of Alzheimer’s and related dementias. It represents a critical step in broadening our nation’s ability to identify high-impact, undeserved areas and in directing resources and strategies where they are needed most. Above all, this report offers a framework and recommendations to ensure the brain health of all communities.

We know first-hand the toll Alzheimer's takes on individuals, families, and communities. This shared experience underscores our call for empathy, unity, and urgent action. The stakes are too high and the wait too long for millions of our families.

As Martin Luther King, Jr. said in his 1966 speech to the Medical Committee of Human Rights, "Of all the forms of inequality, injustice in health is the most shocking and the most inhuman because it often results in physical death." The time is now to use the knowledge and tools at our disposal to address these disparities and build a healthy future for all.

The Honorable Dr. David Satcher, Former United States Surgeon General; Ms. Dolores Huerta, Founder of the Dolores Huerta Foundation & Member of the UsAgainstAlzheimer's Brain Trust





Executive Summary

The COVID-19 pandemic has highlighted social and health inequities across our nation in an unprecedented way. At first, it appeared that the pandemic was an equal opportunity crisis, but the numbers soon started telling a different story of significantly higher cases and greater numbers of deaths in some populations. The Coronavirus has revealed major gaps in our healthcare and social services system in undeserved communities and in communities of color, from poorly equipped hospitals to inadequate housing. Several of these disparities are concentrated in zip-codes with large percentages of traditionally marginalized communities, including Blacks, Latinos, and American Indians.

These gaps are highlighted as well for Alzheimer's disease, another public health crisis that is playing out in the very same communities, exacerbated by systemic racism and exclusionary healthcare and research practices. It is becoming clear: where people live matters when it comes to health disparities and social determinants of health.

Research reveals that Blacks are 2 to 3 times more likely and Latinos 1.5 times more likely to develop Alzheimer's and related dementias (ADRD) compared to non-Latino Whites (Alzheimer's Association 2019), numbers commensurate with the racial disparities of COVID-19 cases.

The effects of where people live, and the social determinants of health are under-recognized and under-appreciated in our national response to effectively treat and prevent Alzheimer's.

This report, for the first time, explores the social determinants of health present in the counties most impacted by Alzheimer's among Latinos and Blacks in the Medicare program. It compares counties with the highest prevalence of Alzheimer's among Blacks, Latinos, and non-Latino Whites against counties with the lowest prevalence among these populations to identify trends related to the social determinants of health and risk factors for Alzheimer's.

Our analysis finds deep social inequities in counties highly impacted by Alzheimer's among Latinos and Blacks.

For example, counties with the highest prevalence of Alzheimer's among Blacks and Latinos are more likely to have worse social determinants of health, such as higher levels of poverty, less household income, less access to exercise opportunities, and less educational attainment compared to counties with the lowest prevalence among Blacks and Latinos. We observed less drastic differences in social determinants in counties with the highest prevalence of ADRD among non-Latino Whites, but notable differences exist related to ADRD risk factors including rates of obesity, diabetes, and other when compared to counties with the lowest prevalence of ADRD.

Systemic barriers in equitable access to health services and research participation, including persistent racial discrimination, are limiting opportunities for brain health among communities of color. In many cases, brain health is inextricably linked to "place" – the geographic location where one is born, lives, works, and ages. Understanding the geographic impacts of Alzheimer's – the sixth leading cause of death for all Americans and the fourth and third leading cause of death for older Black and Latino Americans, respectively (Centers for Disease Control and Prevention, 2019) – is critical given the growing burden the disease is placing on families, our healthcare system, and our economy.

While the public health field's focus on Alzheimer's is growing, there is an urgent need for increased focus and action on the social determinant factors that may shape Alzheimer's risk.

By understanding the relationship between Alzheimer's and the social determinants of health, a place-based approach can help public health departments, policymakers and community researchers better address barriers to healthcare access, research participation, and prevention in communities at greatest risk for Alzheimer's.



Spotlight: Demographic Shifts in the Alzheimer's Patient Population.
By 2030, nearly 40 percent of Americans living with Alzheimer's will likely be Latino or Black.

Introduction

UNDERSTANDING INEQUITIES IN ALZHEIMER'S

Alzheimer's disease and related dementias (ADRD) are a group of illnesses characterized by progressive cognitive decline, memory loss, and the deterioration of other executive functions and activities of daily living. Although advanced age is the most significant risk factor for ADRD, the disease is not a normal part of aging. Currently, 5.8 million people in the United States are living with ADRD (Alzheimer's Association, 2019), with Alzheimer's accounting for roughly two-thirds of all dementias (World Health Organization, 2017). This number is expected to reach 14 million by 2050.

The increasing racial and ethnic diversity of older Americans will contribute to the expected increase in the number of persons living with ADRD in the coming decades if nothing is done to curb the prevalence of the disease. Between 2020 and 2050, the population of Blacks age 65 and older in the United States is expected to double (from 5.4 to 10.8 million), while the older Latino population is projected to more than triple (from 4.9 to 15.9 million) (U.S. Census Bureau, 2017). Given that the most significant risk factor for ADRD is advanced age, these demographic changes, in-combination with associated health risk factors and systemic barriers to health care, place people of color at the center of the Alzheimer's public health crisis.

It is estimated that by 2030, nearly 40 percent of the more than 8 million Americans living with ADRD will be Latino or Black (Aranda, et al., 2019). Today, two-thirds of those living with dementia – and 60 percent of caregivers – are women. Black Americans are two to three times more likely to develop ADRD than non-Latino Whites, while Latinos are 1.5 times more likely than non-Latino Whites (Alzheimer's Association 2019). Examining Medicare data on diagnosed cases

of ADRD suggests more moderate differences of about 20-40 percent in the prevalence of the disease based on race and ethnicity (Centers for Medicare & Medicaid Services, 2015); those numbers, however, may be skewed by higher levels of undiagnosed ADRD among racial and ethnic minorities (Dilworth-Anderson, 2008). In addition, these undercounts are likely heightened by the well-documented barriers to health care and access to social services experienced by people of color and families living below the poverty line. An analysis of data from one health plan, for example, suggests that high-risk groups – those older than 74, Blacks, and Latinos – are more likely to have cognitive impairment but less likely to have had an Annual Wellness Visit (AWV) compared to non-Latino Whites (Mink, et al., 2016). These factors – and the accuracy of data on ADRD – are shaped by place-based barriers and on-the-ground realities that must be better understood.

These problems play out in many places all over the country. According to Dr. Gladys E. Maestre, director of the Alzheimer's Disease Resource Center for Minority Aging Research at the University of Texas Rio Grande Valley, her

community has been particularly hard hit. “In South Texas there are very few services, that’s the first thing,” she says. “Services are based in acute care.” She also points to stigma and a fear of incurring increased medical costs as barriers to an ADRD diagnosis. Dr. Maestre says, “If someone has memory problems for a year or two, they typically say, ‘Well, that’s life.’”

Systemic barriers are limiting access to quality health services and research for people of color at risk for ADRD and other chronic conditions. For example, hospitals that serve predominantly minority patients often provide lower quality care than hospitals that serve a higher percentage of insured patients (Jha, et al., 2008). Further, discrimination may have a negative impact on the cognitive health of people of color (Glymour and Manly, 2008) and, in some cases, may even be linked to worse long-term memory (Johnson et al., 2020). Research also suggests that Blacks are disproportionately affected by stressful life experiences, including housing segregation and other impacts of racism (Boardman, 2004).

Further limiting our ability to address these inequities is a lack of diversity in ADRD research. For example, detection methods for ADRD—including biomarkers—have been developed mostly with homogenous, predominantly White cohorts.

The 2012 demographic report from the Alzheimer’s Disease Neuroimaging Initiative (ADNI), for example, found the Initiative’s sample was comprised of just 5 percent Black and Latino participants. These groups make up less than 20 percent of all clinical trial participants in federally funded ADRD research (National Alzheimer’s Coordinating Center, 2019) and an analysis of more than 300 peer-reviewed studies that focused on non-pharmacological interventions for ADRD found that just under 4 percent are focused on minority populations (UsAgainstAlzheimer’s, 2019). New place-based frameworks that take into account these systemic barriers - including where they are manifesting most - are needed to address these challenges.



Where People Live Matters:

DEVELOPING A PLACED-BASED VIEW OF ALZHEIMER'S

In recent years, research on ADRD has made great strides in increasing the understanding of the causes and origins of the disease, including the genetic and lifestyle factors that affect the brain over time. But there has been significantly less research on the impact of place, including the geographic disparities in the disease's prevalence and how they relate to socioeconomic factors and known modifiable risk factors. These social determinant factors deserve more attention in the race to prevent and cure Alzheimer's.

Levels of education, income, and food insecurity, plus the state of the physical environment – collectively known as social determinants of health – are emerging as key influences on dementia risk. These factors are directly shaped by where people are born, raised, and live. Further, research suggests that disparities in cognitive impairment exist by geography (Case & Paxson, 2009). In fact, one study found that living in a disadvantaged neighborhood may be associated with an increased risk of brain changes typical of ADRD. Study data found that individuals residing in the most disadvantaged neighborhoods – areas with poor socioeconomic conditions – have roughly twice the odds of presenting these brain changes than people who live in the wealthiest neighborhoods; they were also the least likely to be represented in ADRD research despite an increased risk (Powell, et al., 2020). These data suggest critical gaps exist in access to ADRD research and resources

It is crucial to understand place, as so much is interconnected between place and health, especially in a place where resources are extremely scarce and fractured. For example, our analysis finds that counties in South Texas experience both a high ADRD prevalence and high levels of social inequity. As Dr. Maestre points out, "For people who are very poor, health is not their top priority—food is, and even getting a TV working becomes a higher priority than going to a doctor, because it's a way to relieve the chronic stress of being poor. Every day you have to make the decision, 'What do I pay?' It's

"For people who are very poor, health is not their top priority—food is."

Dr. Gladys Maestre

A place-based approach that integrates the social determinants of health can help regional healthcare providers and public health departments shape the development of culturally – and geographically – tailored interventions, including improvements in clinical practice and more equitable research strategies. It can also guide policy changes and public investments to narrow brain health disparities.



Pam's Story...

Pam, 34, married with two young boys, has lived all her life in Alice, a city of just under 20,000 people in South Texas. Alice is the seat of Jim Wells County, one of the counties analyzed in this report. Her husband works in the oil fields, and Pam, with a master's degree in counseling, works for a local Head Start program. Her 88-year-old grandmother, Kina—who has lived all her life in Alice—has dementia that began almost two decades ago with signs of forgetfulness, which became a difficult problem as it got worse. Pam shared that once a family friend called and told her that they encountered Kina driving home, swerving all over—they had to get out of her way to avoid being driven off the road.

Kina's regular doctor in Alice could offer little help and specialists were too far away—Corpus Christi is an hour's drive, San Antonio a two hours' drive. Pam and her mother Nora were against putting Kina in a nursing home; they believed it was the family's duty to take care of her, a sentiment often found in Latino households. They were left with nowhere to turn for advice or help.

The only resource was their own internet research. Eventually, the family made the difficult decision to put her in a local nursing home.

Kina has adjusted well; getting her there—that was a huge challenge, not just as a family decision, but figuring out the medical steps leading to it were left to Nora and Pam.

What's needed in places like Alice, Pam says, "is a place to show up that has support where you can ask, 'What are my next steps?' where you are guided through the process, and sent places for care." This still doesn't exist in Alice.

Our Approach and Key Report Findings

To put a spotlight on social determinants of health present in counties hard hit by Alzheimer's, we analyzed Medicare data to identify the counties across the country with the highest and lowest Alzheimer's prevalence by race and ethnicity, and compared their demographic, health, and socioeconomic profiles. Our analysis focuses on exploring the social determinants of health and on the modifiable health risk factors associated with ADRD to understand place-based trends. While still recognizing that age remains the single most important risk factor for developing dementia and that other genetic factors also play a critical role (Moore et al., 2015), social determinant factors are becoming increasingly important to brain health (Taylor et al., 2020).

We do not propose that the social determinants of health cause Alzheimer's. However, growing evidence suggests that dementia risk can be modified by brain-healthy behaviors, including effective management of hypertension, diabetes and obesity and by addressing social determinants such as air pollution and education. The Lancet Commission has found that managing certain risk factors could prevent or delay approximately 40 percent of worldwide dementia cases (Livingston, G. et al. 2020). Many of these risk factors are directly shaped by place, including education, social isolation, physical inactivity, and air pollution. These same factors impact communities of color and low resourced communities disproportionately, meaning that Alzheimer's risk-reduction opportunities could be even greater within those populations if these risk factors and social determinants of health are addressed equitably and urgently. Despite this opportunity, under-resourced communities are at a disadvantage in managing these risk factors due to deep inequities in education, low access to exercise opportunities and to healthy food.

SUMMARY OF KEY FINDINGS

Our analysis revealed that counties with the highest prevalence of Alzheimer's disease among Blacks and Latinos experience worse social determinants of health when compared to counties with the lowest prevalence among Blacks and Latinos. These counties experience:

LOWER LEVELS OF EDUCATIONAL ATTAINMENT

- Only 16 percent of adults have a bachelor's degree in counties with the highest prevalence of ADRD among Blacks, compared to 32 percent of adults in counties with the lowest prevalence.
- Only 19 percent of adults have a bachelor's degree in counties with the highest prevalence of ADRD among Latinos, compared to 27 percent of adults in counties with the lowest prevalence.

LOWER MEDIAN HOUSEHOLD INCOMES

- The median household income of individuals living in counties with the highest prevalence of ADRD among Blacks was 41 percent lower compared to counties with the lowest ADRD prevalence. For Latinos, median household income was 32 percent lower.

LOWER RATES OF PHYSICAL ACTIVITY AND MORE CONSTRAINTS ON ACCESS TO LOCATIONS FOR EXERCISE

- Just 55 percent of adults in counties with the highest prevalence of ADRD among Blacks had access to exercise opportunities, compared to 83 percent in counties with the lowest prevalence.
- In counties with the highest prevalence of ADRD among Latinos, 52 percent of adults had access to exercise opportunities, compared to 77 percent in counties with the lowest prevalence.

WORSE SELF-RATED HEALTH STATUS (MEASURES OF PHYSICAL AND MENTAL DISTRESS)

- One in five adults (20 percent) rated their health as fair or poor in counties with the highest ADRD prevalence among Blacks compared to 14 percent of those living in counties with the lowest prevalence of ADRD.
- Among Latinos, nearly one in four adults (24 percent) rated their health fair or poor in counties with the highest ADRD prevalence compared to 17 percent of those living in counties with the lowest prevalence of ADRD.

Further, we found that counties with the highest prevalence of ADRD among Latinos and Blacks were more likely to be rural than counties with the lowest prevalence among Latinos and Blacks, which were more likely to be urban.

- 60 percent of the of the counties with the highest prevalence of ADRD among Blacks were rural, compared to 23% for the counties with the lowest prevalence among Blacks.
- Nearly half (46 percent) of the counties with the highest prevalence of ADRD among Latinos were rural, compared to 25% for the counties with the lowest prevalence among Latinos.

Counties with the highest prevalence of ADRD among non-Latino Whites experienced less drastic differences in social determinants but experienced noticeable differences in lifestyle-related modifiable risk factors, including:

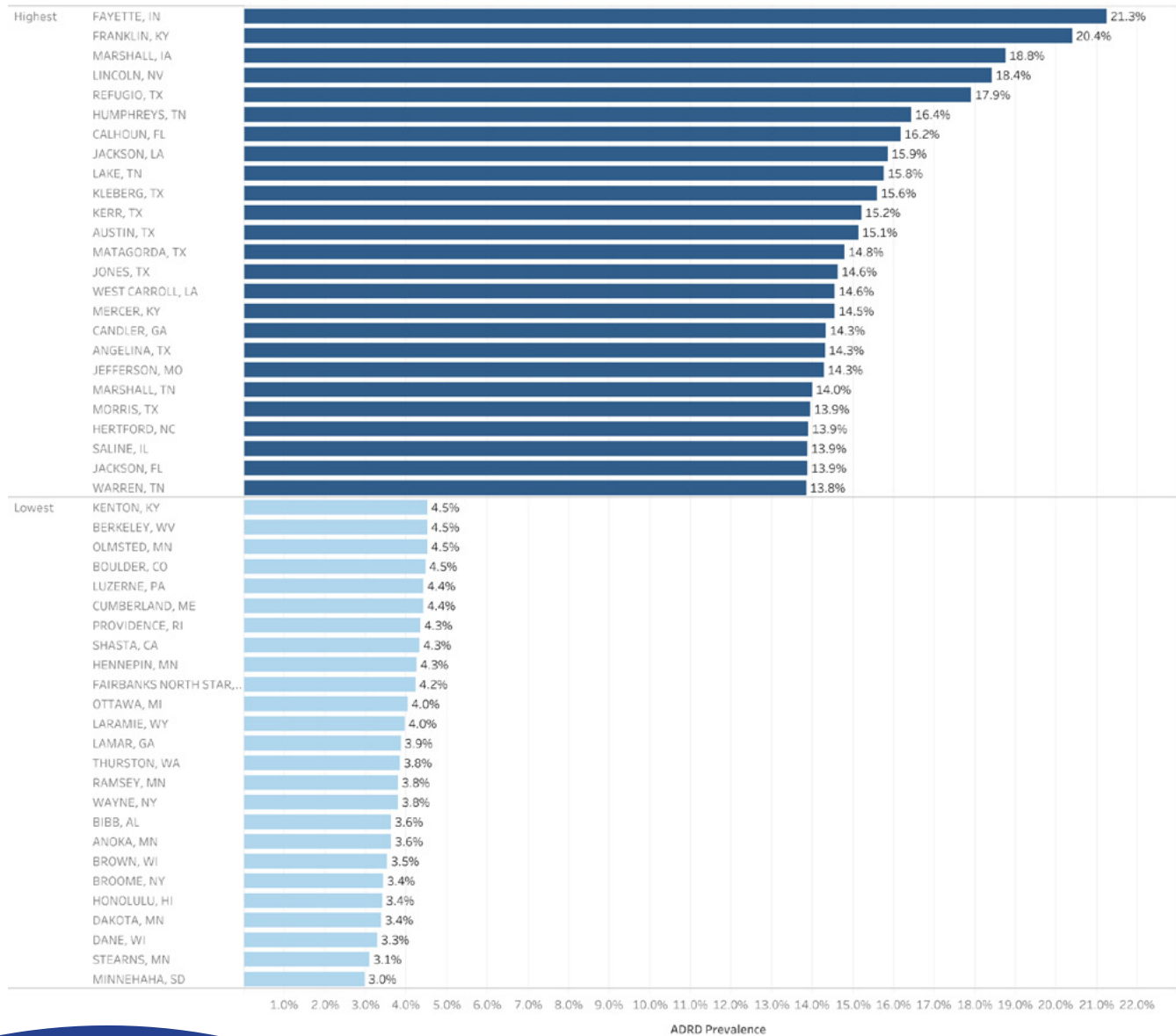
- Higher rates of diabetes, obesity, and physical inactivity
 - The rate of diabetes is almost 50 percent higher and the rate of obesity is 30 percent higher in counties with the highest prevalence of ADRD among non-Latino Whites than in counties with the lowest prevalence
 - The rate of physical inactivity is 30 percent higher in counties with the highest prevalence of ADRD among non-Latino Whites than in counties with the lowest prevalence.

These social determinant and place-based factors represent potential barriers to public health interventions and research access that must be addressed. With further research and investment, a place-based framework that incorporates the social determinants of health could help improve access to brain-health-related health services, research opportunities and public health interventions for under-resourced communities.

SUMMARY OF KEY FINDINGS

25 Counties with the Highest and Lowest ADRD Prevalence Among Blacks (Medicare Fee for Service, 2016)

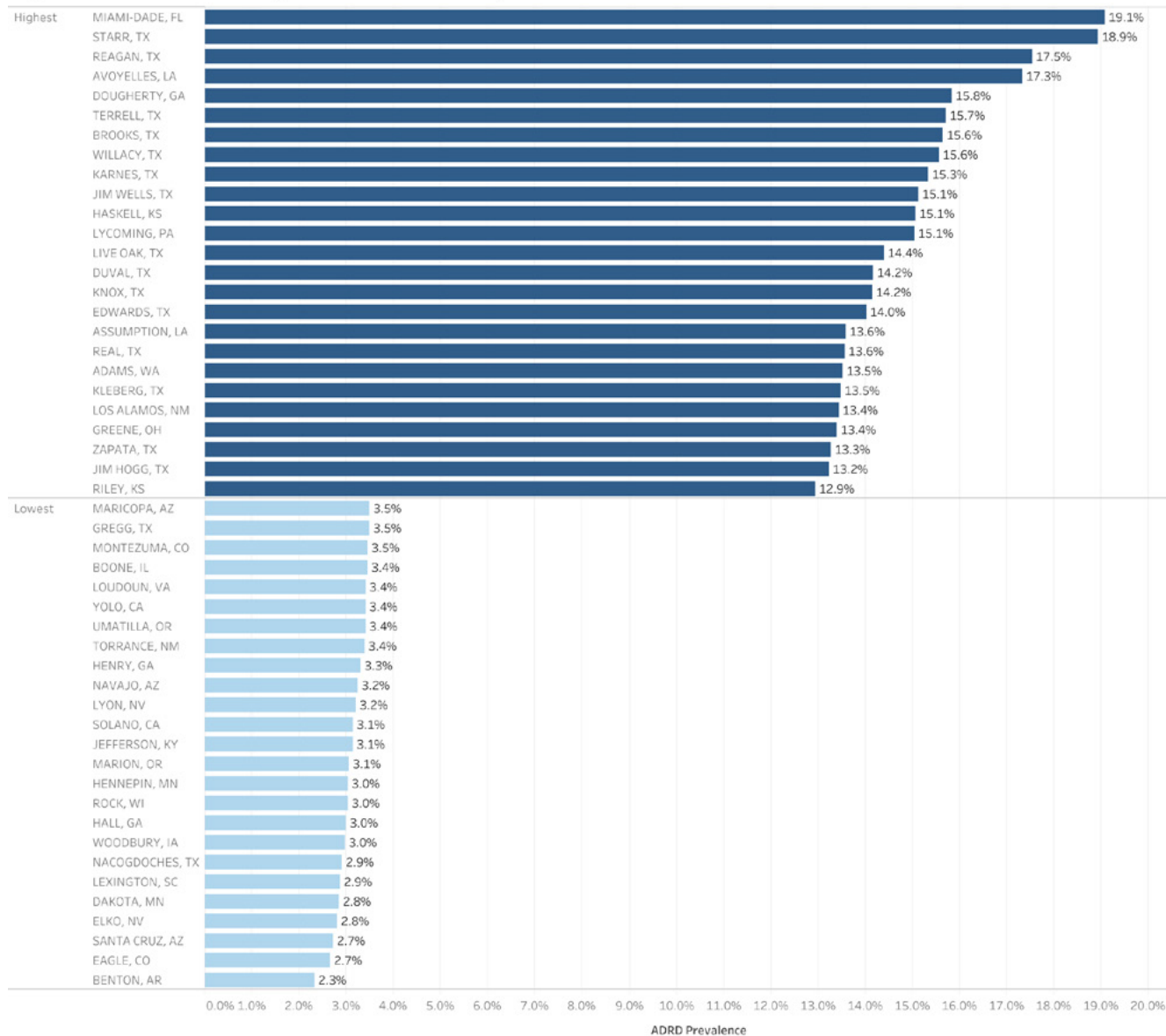
Top and Bottom 25 Counties by ADRD Prevalence Among Blacks



SUMMARY OF KEY FINDINGS

25 Counties with the Highest and Lowest ADRD Prevalence Among Latinos (Medicare Fee for Service, 2016)

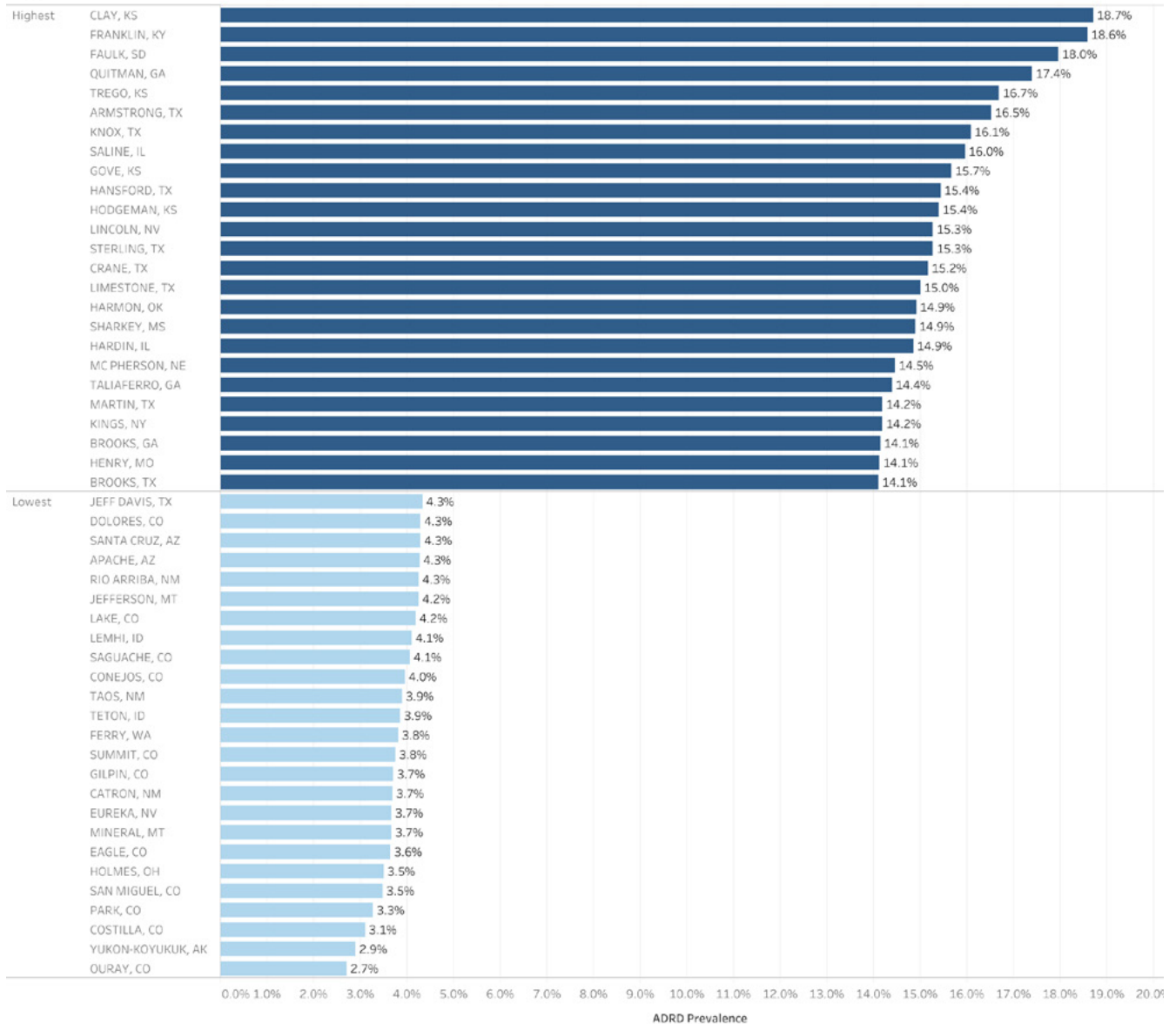
Top and Bottom 25 Counties by ADRD Prevalence Among Latinos



SUMMARY OF KEY FINDINGS

25 Counties with the Highest and Lowest ADRD Prevalence Among Non-Latino Whites (Medicare Fee for Service, 2016)

Top and Bottom 25 Counties by ADRD Prevalence Among Non-Latino Whites



More Detailed 25 County Listing in the Appendix

Methods

To determine the ADRD prevalence by race and ethnicity, we used 2016 county-level Medicare fee-for-service (MFFS) data obtained through the National Alzheimer’s Disease Index™ - a public health tool developed by UsAgainstAlzheimer’s with support from the National Minority Quality Forum. Although Medicare data are collected for all counties, they are suppressed for analytic purposes for counties where 10 or fewer beneficiaries of a racial/ethnic group of interest had an ADRD diagnosis. Medicare data are a valuable resource for studying healthcare patterns, but important limitations exists, including inaccuracies in identifying racial and ethnic beneficiaries (Zaslavsky et al., 2012). Because of our interest in identifying trends for the Latino population in addition to the Black and White population, we use the Research Triangle Institute (RTI) Race Code that was developed for Medicare administrative data to correct for the undercount of Latino and, to a lesser extent, the Asian American and Pacific Islander populations (Eicheldinger & Bonito, 2008). We merged Medicare data with county-level demographic, socioeconomic, and health information from the U.S. Census Bureau (American Community Survey and Small Area Health Insurance Estimates) and the County Health Rankings for the corresponding (or nearest available) year.

We used 2016 Medicare Carrier, Outpatient, In-patient (containing 100 percent of the Medicare fee-for-service population) to calculate the number of Medicare beneficiaries who were treated for Alzheimer’s disease and related disorders or senile dementia Alzheimer’s (referred to as ADRD in this paper) using the following ICD 9 codes and ICD 10 codes.

Algorithms	Reference Period (# of years)	Valid ICD-9 /CPT4/ HCPCS Codes	Valid ICD-10 / CPT4 /HCPCS Codes	Number/Type of Claims to Qualify
Alzheimer's Disease and Related Disorders or Senile Dementia	3 years	DX 331.0, 331.11, 331.19, 331.2, 331.7, 290.0, 290.1, 290.11, 290.12, 290.13, 290.20, 290.21, 290.3, 290.40, 290.41, 290.42, 290.43, 294.0, 294.1, 294.11, 294.20, 294.21, 294.8, 797 (any DX on the claim)	DX F01.50, F01.51, F02.80, F02.81, F03.90, F03.91, F04, G13.8, F05, F06.1, F06.8, G30.0, G30.1, G30.8, G30.9, G31.1, G31.2, G31.01, G31.09, G94, R41.81, R54 (any DX on the claim)	At least 1 inpatient, SNF, HHA, HOP, or Carrier claim with DX code

We limited our sample to the top 25 counties with the highest and lowest ADRD prevalence for each of the three racial and ethnic groups.² By doing so, we could highlight differences between the characteristics of place with the extreme values of ADRD prevalence for each of the racial and ethnic groups of interest. Although these differences are often overlooked in favor of examining differences

² Because several counties appear in more than one ranking, our final dataset includes 140 counties from 40 states. The full list of counties by race and ethnicity ranked by ADRD prevalence is available in the Appendix.

across racial and ethnic groups, they are substantively important for understanding the unique ways in which place may impact health and socioeconomic conditions for different racial and ethnic groups. Next, we created averages of ADRD prevalence and various factors of interest (see Table 1 below) for the selected counties and calculated related 90 percent confidence intervals³.

This measure allows us to establish plausible ranges for the true values of different variables rather than relying on their mean values alone. Moreover, it is arguably more relevant in the context of this study than some other measures such as p-values due to the strictly descriptive nature of the analysis and no explicit hypotheses testing.

Using these averages, we constructed demographic and health profiles of the counties of interest by demographic group, analyzing the counties with the highest and lowest prevalence among Latinos, Black Americans, and non-Latino Whites. This was followed by exploring the key modifiable risk factors, and finally focusing on the socioeconomic correlates of ADRD. This approach allows us to emphasize the geographic aspect of ADRD prevalence by giving equal importance to sociodemographic characteristics of each county in each group of 25 counties.

Table 1. Factors of interest included

Demographic Profile	Health Profile	Modifiable Risk Factors	Socioeconomic Profile
Age, race and ethnicity, foreign born status, rural status, 65+ living alone status. (sources: American Community Survey; County Health Rankings for percentage of population living in a rural ⁴ area)	Fair or poor health status, frequent physical distress status, frequent mental distress status, disability status (age 65+) (sources: County Health Rankings; American Community survey for disability status of adults 65+)	Rates of diabetes, obesity, physical inactivity, smoking, and insufficient sleep, access to exercise opportunities, food environment index, and air pollution. (source: County Health Rankings)	Bachelor's degree or higher, median household income, high-to- low income ratio, families in poverty, and health insurance status (younger than 65). (sources: American Community Survey; County Health Ranking for median household income; Small Area Health Insurance Estimates for health insurance status)

While not used here, we recommend that future research examine population-standardized prevalence rates for additional insights. A sharper focus on population structure would help address potential bias in our analysis that could vary by different types of factors (e.g., overestimating the importance of health factors or underestimating the importance of socioeconomic factors). This is an important area for future research by UsAgainstAlzheimer's National Alzheimer's Disease Index™ data working group. A more detailed description of the methods is provided in the appendix.

³ See definition in glossary

⁴ Rural communities are defined as groups of census tracts with a population of less than 2,500 persons.

Findings by County Demographic Groupings

COUNTIES WITH THE HIGHEST AND LOWEST ADRD BURDEN AMONG BLACK AMERICANS

DEMOGRAPHIC CHARACTERISTICS

Counties with the highest ADRD prevalence are predominantly rural, that is, the majority of their population lives in rural communities, whereas those with the lowest prevalence are overwhelmingly urban (see Table 2). This finding supports research that suggests that dementia and cognitive impairment are more prevalent among rural dwelling seniors than urban dwelling seniors (Weden, et al., 2018) and that living in a non-urban area is linked to worse long-term memory (Johnson et al., 2020). It also underscores the importance of supporting efforts to make rural communities more dementia-capable by leveraging telehealth solutions to expand the healthcare system's reach into them. COVID-19 has precipitated a major increase in the use and reimbursement of telehealth services with, for example, video visits between patients and their doctors; these solutions should be expanded and focused to improve access to Alzheimer's-related health services in rural communities.

Table 2. Demographic profile of counties with the highest and lowest rates of ADRD for Blacks in 2016 (%)

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Age 65+	17.4	16.5 - 18.3	14.1	13.3 - 14.9
Age 85+	2.1	1.9 - 2.3	1.9	1.7 - 2.1
Non-White	29.7	23.3 - 36.0	22.7	18.1 - 27.4
Foreign born	4.1	3.1 - 5.2	7.5	5.9 - 9.0
U.S. citizen ^a	35.2	30.2 - 40.2	48.7	45.6 - 51.8
Rural	60.6	53.1 - 68.1	22.5	16.4 - 28.5
Age 65+ living alone ^b	39.2	38.1 - 40.4	39.4	37.9 - 40.9

a Foreign-born population with U.S. citizenship.

b Percentage of one-person households among all households with at least one individual age 65 and older.

⁵ Rural communities are defined as groups of census tracts with a population of less than 2,500 persons.

⁶ Urban is defined as Urban Clusters of at least 2,500 and less than 50,000 people and Urbanized Areas of 50,000 or more people.

HEALTHCARE CHARACTERISTICS

Counties with the highest prevalence of ADRD among Blacks have a distinctly worse health profile – measures of self-rated health quality and measures of physical and mental distress – when compared to counties with the lowest prevalence of ADRD for Blacks (see Table 3). The percentage of adults reporting poor or fair health is an often-used measure of health-related quality of life, and research consistently suggests that, although self-reported, this measure corresponds well with one’s objective health status (Andresen et al., 2003; DeSalvo et al., 2006). Indeed, it is also a strong predictor of dementia, even among those without cognitive complaints or functional disability (Montlahuc et al., 2011; Waldorff et al., 2010).

The share of disabled older adults is about nine percentage points higher in counties with the highest compared to the lowest ADRD prevalence (43 percent vs. 34 percent). This finding highlights an opportunity to develop closer ties between the disability community and the dementia community to improve the overall livability of neighborhoods and communities. For example, the Centers for Disease Control and Prevention’s Healthy Brain Initiative is funding work by the University of Illinois Chicago (UIC) to promote brain health strategies targeting people living with intellectual and developmental disabilities (University of Illinois Chicago, 2020; Heller, 2020).

Table 3. Health profile of counties with the highest and lowest rates of ADRD for Blacks in 2016 (Percentage %)

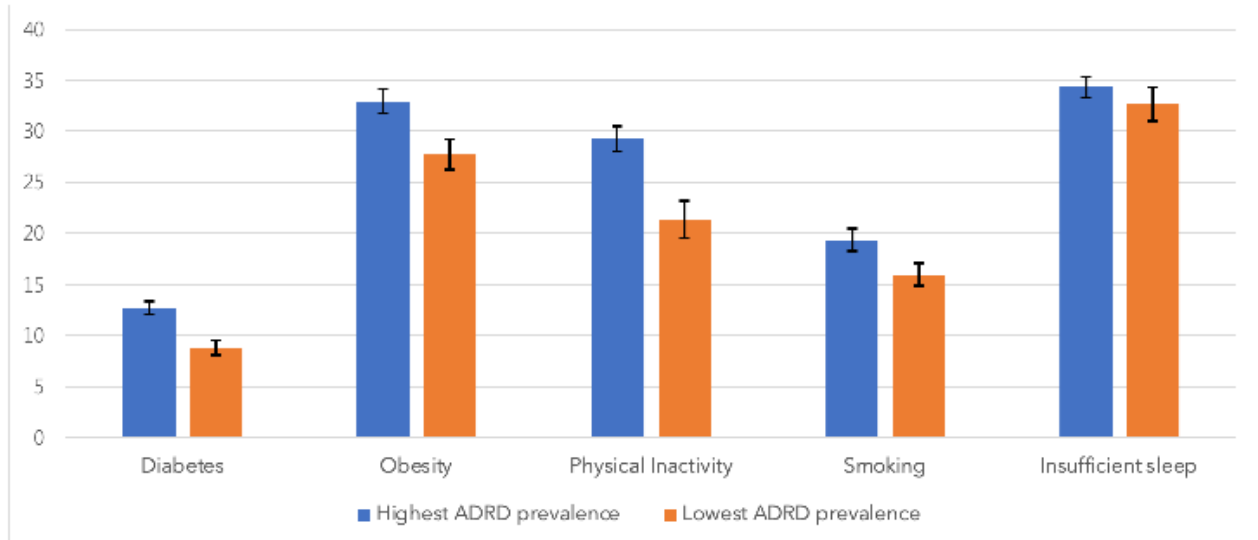
	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Fair or poor health	20.4	19.3 - 21.6	13.9	12.8 - 15.0
Frequent physical distress	13.0	12.5 - 13.6	10.3	9.7 - 10.9
Frequent mental distress	12.7	12.3 - 13.1	10.8	10.3 - 11.4
Age 65+ with disability	42.9	40.7 - 45.1	33.9	32.6 - 35.3

MODIFIABLE RISK FACTORS

Turning to modifiable risk factors of ADRD (Figure 1 and Table 4), we find meaningful differences across counties with the highest and lowest prevalence of ADRD among Blacks. There is an almost eight percentage point difference in the rates of leisure physical activity, for example, over the past month (29.3 percent vs. 21.4 percent). Smaller differences are observed for other health-risk factors, including the percentage of obese adults, smokers, and adults reporting fewer than seven hours of sleep on average. But the point can be made: All these factors are higher in counties where Blacks have the highest rates of diagnosed ADRD compared to the counties where they have the lowest ADRD rates⁷.

⁷ Insufficient sleep is the only risk factor for which 90% confidence intervals for the two groups of counties overlap, suggesting less certainty that the true values of this factor are different across the two groups of counties.

Figure 1. Average percentage of adults reporting various lifestyle-related modifiable risk factors of ADRD across counties with the highest and lowest prevalence of ADRD for Blacks, 2016 or latest available year.



Note: Each bar on the figure represents an average of 25 counties with the highest and lowest ADRD prevalence for Blacks and includes related 90 percent confidence interval.

We find substantial differences between counties with the highest and lowest prevalence of ADRD among Blacks with respect to environmental modifiable risk factors associated with an unhealthy lifestyle (see Table 4). In counties with the lowest burden of ADRD among Blacks, 83 percent of adults have access to exercise opportunities, compared to just 55 percent of adults in the counties with the highest burden of ADRD. In the counties with the highest prevalence of ADRD among Blacks, we also observe less access to healthy foods and more food insecurity. Understanding and addressing community-level barriers to leading a healthy lifestyle are critical, as growing evidence suggests that these behaviors (physical activity, high-quality diet, etc.) are associated with substantially lower risk for Alzheimer’s disease (Dhana et al., 2020).

Table 4. Environmental, modifiable risk factors of ADRD across counties with the highest and lowest prevalence of ADRD for Blacks, 2016 or latest available year.

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Access to exercise opportunities (%)	54.9	48.5 - 61.3	83.4	78.0 - 88.8
Food environment index	7.0	6.7 - 7.3	8.1	7.9 - 8.2
Air pollution ($\mu\text{g}/\text{m}^3$)	9.1	8.7 - 9.6	8.8	8.4 - 9.3

SOCIOECONOMIC CHARACTERISTICS

The socioeconomic differences—from education to health insurance rates (see Table 5)—between counties with the lowest and highest burden of ADRD among Blacks were stark. In counties with the highest ADRD prevalence among Blacks, just 16 percent of adults have a bachelor’s degree or higher, compared to almost 32 percent of adults in counties with the lowest ADRD prevalence. Education is fundamentally important. Dr. William Vega, a contributor to this paper and long-time Alzheimer’s researcher has said: “There is no more consistent or reliable indicator of brain health, specifically cognitive function, than education.”

Furthermore, we find significantly lower median household incomes (41 percent lower), in counties with the highest prevalence of ADRD and, not surprisingly, substantially fewer households in the highest income brackets in those counties. The proportion of adults younger than 65 who lack health insurance is twice as high in counties with the highest ADRD prevalence relative to the counties with the lowest ADRD prevalence among Blacks.

Table 5. Socioeconomic profile of counties with the highest and lowest prevalence of ADRD for Blacks in 2016 (%)

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Bachelor’s degree or higher (%)	16.2	14.5 - 17.8	31.7	28.1 - 35.3
Median household income (\$)	45,580	42,817 - 48,343	64,348	60,588 - 68,109
High-to-low-income ratio ^a	0.8	0.7 - 1.0	1.9	1.6 - 2.3
Families in poverty (%)	14.8	13.3 - 16.4	8.7	7.6 - 9.7
No health insurance, younger than 65 (%)	14.1	12.4 - 15.8	7.0	6.1 - 7.9

Note: ^a Ratio of households with annual incomes of at least \$75,000 to households with incomes of less than \$25,000.

COUNTIES WITH THE HIGHEST AND LOWEST ADRD BURDEN AMONG LATINOS

Turning our focus to counties with the highest and lowest ADRD prevalence for Latinos, the data reveals deep structural inequities in those with the highest burden of ADRD among Latinos, just as was seen in counties with the highest ADRD prevalence among Blacks.

DEMOGRAPHIC CHARACTERISTICS

On average, almost half of the population in counties with the highest ADRD prevalence among Latinos lives in rural areas compared to just a quarter in the counties with the lowest prevalence. Counties with the highest ADRD prevalence for Latinos also have a majority minority population, unlike the counties with the lowest ADRD prevalence for Latinos, yet the share of foreign-born population and naturalized citizens is similar across the two groups of counties. Once again, these data suggest the importance of investing in telehealth solutions for brain health (e.g., video screenings and assessments) and in ensuring that existing solutions are culturally tailored to reach communities of color living in rural communities.

Table 6. Demographic profile of counties with the highest and lowest prevalence of ADRD for Latinos in 2016 (Percentage %)

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Age 65+	16.6	14.6 - 18.7	13.6	12.7 - 14.5
Age 85+	2.0	1.6 - 2.4	1.6	1.4 - 1.7
Non-White	59.0	49.9 - 68.0	37.4	32.5 - 42.4
Foreign born	12.1	8.2 - 16.0	11.8	9.5 - 14.1
U.S. citizen ^a	34.7	29.4 - 40.0	39.1	35.2 - 43.0
Rural	45.9	34.8 - 57.1	24.8	17.5 - 32.1
Age 65+ living alone ^b	37.7	35.7 - 39.7	36.2	34.5 - 38.0

Notes: ^a Foreign-born population with the U.S. citizenship.

^b Percentage of one-person households among all households with at least one person age 65 and

HEALTHCARE CHARACTERISTICS

Data suggest a worse Latino health profile for counties where the Latino population has the highest prevalence of ADRD (see Table 7). For example, in counties with the highest ADRD burden, one in four Latino adults reports fair or poor health, compared to one in six adults in counties with the lowest ADRD burden. The percentage of people with frequent physical distress is also higher in counties with the highest ADRD prevalence, and these counties also average 10 percentage points more disabled adults age 65 and older.

Table 7. Health profile of counties with the highest and lowest prevalence of ADRD for Latinos in 2016 (Percentage %)

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Fair or poor health	24.1	21.5 - 26.7	16.9	15.7 - 18.2
Frequent physical distress	13.5	12.6 - 14.4	11.7	10.9 - 12.4
Frequent mental distress	12.3	11.8 - 12.8	11.8	11.2 - 12.4
Age 65+ with disability	45.7	42.5 - 48.9	35.7	33.8 - 37.6

MODIFIABLE RISK FACTORS

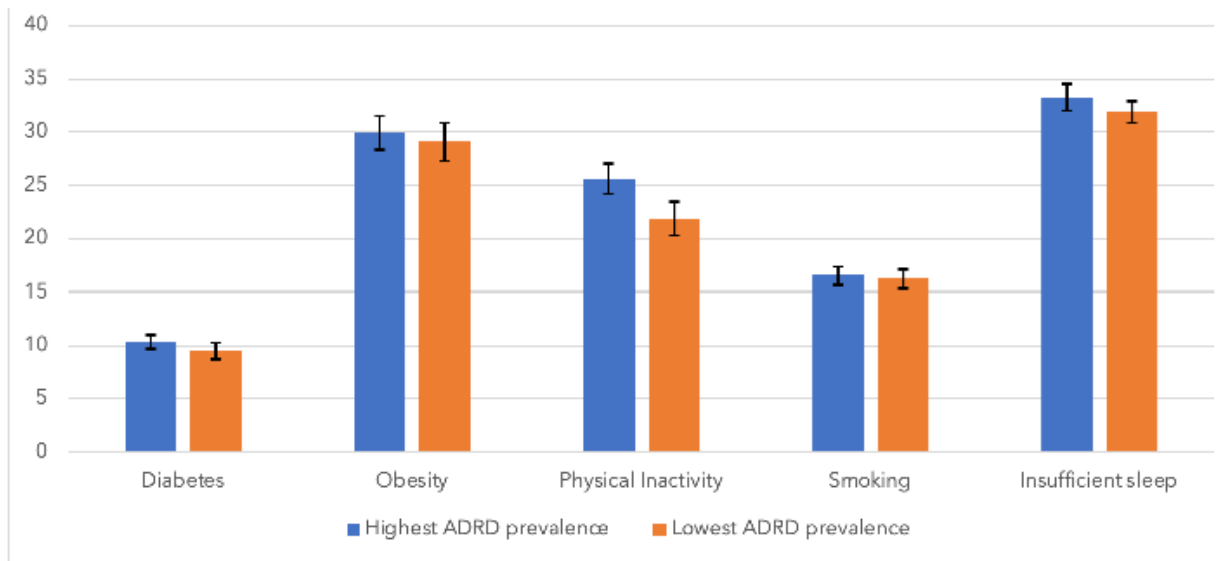
Focusing on the built environment (homes, buildings, streets, open spaces and infrastructure that influence physical activity), we find that more than three out of four Latino residents of counties with the lowest ADRD prevalence have access to exercise opportunities compared to about half (52 percent) of residents in the counties with the highest ADRD (Table 8). This is consistent with the observed difference in physical inactivity among high-prevalence Latino counties. However, we found no substantial difference in other environmental modifiable risk factors – that is, food environment and air pollution.

Table 8. Environmental modifiable risk factors of ADRD across counties with the highest and lowest prevalence of ADRD for Latinos, 2016 or latest available year.

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Access to exercise opportunities (%)	52.2	42.7 - 61.7	77.1	70.5 - 83.7
Food environment index	7.1	6.6 - 7.6	7.6	7.2 - 8.0
Air pollution ($\mu\text{g}/\text{m}^3$)	8.0	7.6 - 8.4	8.8	8.2 - 9.5

Results in Figure 2 suggest that there are only limited differences in lifestyle-related risk factors of ADRD between the counties with the highest and lowest ADRD prevalence for the Latino population. While rates of diabetes, obesity, smoking, and insufficient sleep are higher across the counties with the highest ADRD prevalence for Latinos, the differences are small. However, differences in rates of physical inactivity are consistent with our findings related to limited access to exercise opportunities in counties with the highest rates of ADRD among Latinos.

Figure 2. Percentage of Latino adults reporting various lifestyle-related modifiable risk factors of ADRD across counties with the highest and lowest prevalence rates, 2016 or latest available year.



Note: Each bar on the figure represents an average of 25 counties with the highest and lowest ADRD prevalence for Latinos and includes related 90% confidence interval.

SOCIOECONOMIC CHARACTERISTICS

Socioeconomic profiles of the two groups of counties are markedly different (see Table 9). On average, in counties with the highest ADRD prevalence among Latinos, fewer than 20 percent of residents have at least a bachelor's degree, while 28 percent of residents in counties with the lowest Latino ADRD prevalence do. Median household incomes are about one third lower, and the percentage of families living in poverty are almost six percentage points higher in counties with the highest ADRD prevalence. Also, 7 percent more Latinos under the age of 65 in the counties with the highest ADRD prevalence have no health insurance compared to Latinos in the counties with the lowest prevalence.

These structural inequities suggest limited opportunities to prioritize brain-healthy behaviors and activities in counties with the highest prevalence of ADRD among Latinos and Black Americans. As Dr. Maestre has observed in South Texas, “For people who are very poor, health is not their top priority – food is.”

Table 9. Socioeconomic profile of counties with the highest and lowest prevalence of ADRD for Latinos in 2016 (Percentage %)

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Bachelor’s degree or higher (%)	19.3	15.1 - 23.6	27.7	24.1 - 31.3
Median household income (\$)	46,459	40,593 - 52,325	62,656	56,143 - 69,170
High-to-low income ratio ^a	0.9	0.4 - 1.3	1.6	0.8 - 2.5
Families in poverty (%)	17.3	14.4 - 20.2	11.5	9.9 - 13.1
No health insurance, younger than 65 (%)	18.1	15.8 - 20.5	11.3	9.7 - 12.9

Note: a Ratio of households with annual incomes of at least \$75,000 to households with incomes of less than \$25,000.

COUNTIES WITH THE HIGHEST AND LOWEST ADRD BURDEN AMONG NON-LATINO WHITES

The place-based differences in counties with the lowest and highest prevalence of ADRD for non-Latino Whites are less drastic compared to the other groups that were analyzed, but still reveal important trends of the social determinants of health, including consistently lower levels of educational attainment and higher levels of disability among high-burden counties.

DEMOGRAPHIC CHARACTERISTICS

Demographically, these counties have roughly comparable profiles, except for the fact that the percentage of adults ages 85 and older is substantively higher in counties with the highest ADRD prevalence for non-Latino Whites (see Table 10).

Table 10. Demographic profile of counties with the highest and lowest rates of ADRD for non-Latino Whites in 2016 (Percentage %)

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Age 65+	18.8	17.5 - 20.2	18.4	16.1 - 20.8
Age 85+	2.6	2.2 - 3.0	1.7	1.3 - 2.1
Non-White	32.9	24.3 - 41.5	33.2	24.2 - 42.2
Foreign born	6.3	3.6 - 9.0	6.9	4.5 - 9.3
U.S. citizen ^a	41.0	33.3 - 48.7	46.3	38.9 - 53.7
Rural	74.0	63.3 - 84.8	81.4	71.9 - 90.8
Age 65+ living alone ^b	40.2	37.7 - 42.7	36.0	33.7 - 38.3

Notes: ^a A share of foreign-born population with U.S. citizenship.

^b Percentage of one-person households among all households with at least one householder age 65

HEALTHCARE CHARACTERISTICS

Results in Table 11 reveal that the general health profiles of the two groups of counties are similar as well. The percentage of persons reporting frequent physical or mental distress is approximately equal, and the difference in the percentage of persons reporting poor or fair health does not appear to vary substantially. And although there is an almost five-percentage-point higher proportion of older adults with a disability among the counties with the highest ADRD prevalence for non-Latino Whites, even this difference is modest.

Table 11. Health profile of counties with the highest and lowest prevalence of ADRD for non-Latino Whites in 2016 (Percentage %)

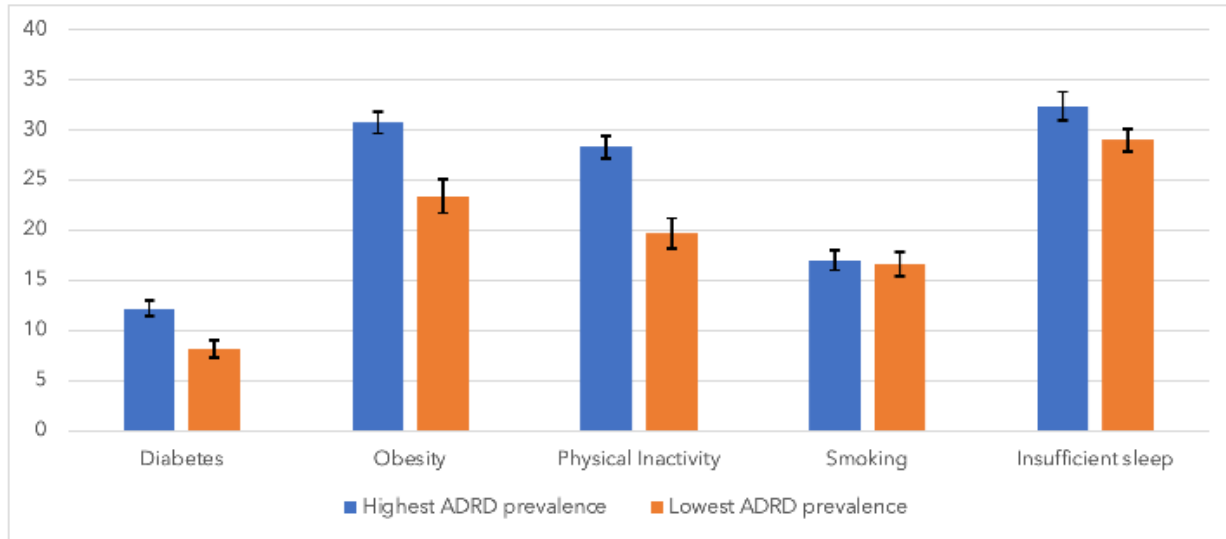
	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Fair or poor health	19.0	17.0 - 21.0	17.3	15.4 - 19.3
Frequent physical distress	12.1	11.2 - 12.9	12.1	11.2 - 13.1
Frequent mental distress	11.9	11.3 - 12.5	12.2	11.4 - 12.9
Age 65+ with disability	42.1	39.5 - 44.7	37.3	33.5 - 41.1

MODIFIABLE RISK FACTORS

Place-based differences in modifiable risk factors varied substantially between the two groups of counties (see Figure 3). For example, the prevalence of adult diabetes is almost 50 percent higher in counties with the highest compared to the lowest ADRD prevalence for non-Latino Whites (12.2 percent vs. 8.2 percent), and the prevalence of adult obesity and physical inactivity is 7.4 and 8.6 percentage points higher, respectively.

The share of adults who report insufficient sleep is also slightly higher across counties with the highest ADRD prevalence for non-Latino Whites (32.4 percent vs. 29.0 percent). Only the prevalence of smoking is similar across the two groups of counties.

Figure 3. Average percentage of adults reporting various lifestyle-related modifiable risk factors of ADRD across counties with the highest and lowest prevalence of ADRD for non-Latino Whites, 2016 or latest available year.



Note: Each bar on the figure represents an average of 25 counties with the highest and lowest ADRD prevalence for Latinos and includes related 90 percent confidence interval.

Among environmental modifiable risk factors, there is no apparent difference in food environment between the two groups of counties, and evidence is inconclusive regarding access to exercise opportunities, as shown in Table 12. On the other hand, air pollution appears to be in excess of 50 percent higher across counties with the highest compared to the lowest prevalence of ADRD for non-Latino Whites (8.2 µg/ m³ vs. 5.3 µg/m³).⁷

Table 12. Environmental modifiable risk factors of ADRD across counties with the highest and lowest prevalence of ADRD for non-Latino Whites, 2016 or latest available year.

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Access to exercise opportunities (%)	54.1	44.5 - 63.7	64.5	56.4 - 72.6
Food environment index	6.7	6.2 - 7.2	6.8	6.0 - 7.5
Air pollution (µg/m ³)	8.2	7.7 - 8.6	5.3	4.8 - 5.9

⁷ However, no county included in our analysis had an air pollution level in excess of 12 µg/ m³, the annual standard for particle pollution currently set by the U.S. Environmental Protection Agency.

SOCIOECONOMIC CHARACTERISTICS

While the socioeconomic profiles of the two groups of counties appear fairly similar (see Table 13), the contrast in rates of educational attainment stood out. Similar to counties with a high ADRD burden among Latinos and Blacks, counties with the highest ADRD prevalence for non-Latino Whites had 7.8 percent fewer individuals with at least a bachelor’s degree compared to counties with the lowest prevalence. All other variables of interest, including median household income, ratio of households with high and low income, percentage of families in poverty, and the percentage of adults under the age of 65 without health insurance do not unequivocally point to a systematic socioeconomic difference between the two groups of counties.

Table 13. Socioeconomic profile of counties with the highest and lowest prevalence of ADRD for non-Latino Whites in 2016 (Percentage %)

	Counties with the highest ADRD prevalence		Counties with the lowest ADRD prevalence	
	Mean value	90% Confidence interval	Mean value	90% Confidence interval
Bachelor’s degree or higher (%)	19.8	17.7 - 21.9	27.6	23.2 - 31.9
Median household income (\$)	48,084	44,109 - 52,059	50,495	45,058 - 55,932
High-to-low income ratio ^a	0.9	0.7 - 1.1	1.0	0.6 - 1.5
Families in poverty (%)	13.6	11.2 - 16.1	11.2	9.0 - 13.5
No health insurance, younger than 65 (%)	15.5	13.5 - 17.6	13.3	11.5 - 15.2

Note: ^a Ratio of households with annual incomes of at least \$75,000 to households with incomes of less than \$25,000.

Conclusion and Recommendations

Where people live matters when it comes to ADRD. Social determinants of health influence dementia risk; those determinants are directly associated with the places where people conduct their lives. That's why place is an important frame for looking at how the disease impacts some areas at much higher rates than others, a perspective that could help the field understand and address systemic barriers to health services, research, and prevention.

The stakes are high for families, communities and our nation. There is no cure yet for Alzheimer's, and the number of persons affected by it continues to increase rapidly, exacting ever-growing costs for individuals, their families, and society at large. In fact, out of the top ten leading causes of death in the United States, Alzheimer's is the only one on the rise.

However, there is reason to be optimistic: Research suggests the potential importance of modifiable risk factors in curbing Alzheimer's. For example, data from two NIH studies show a 60 percent lower Alzheimer's risk among those with the highest number of healthy behaviors, such as regular physical activity, not smoking, light-to-moderate alcohol consumption, a high-quality diet, and frequent cognitive activities (Dhana K, et al. 2020). Further, strengthening educational pathways and school quality may also improve cognitive health and help reduce brain health disparities (Sisco S, et al. 2015). These are strong signals that we can do something about this growing public health challenge.

Yet there are several obstacles that must be addressed. Both the length and quality of life for millions of people are being shortened by the social determinants of health. What's more, the systems meant to treat conditions such as Alzheimer's have been built unequally and, in some cases, unjustly, limiting brain health from an early age for low-resourced families and communities. This report highlights community-level barriers that exist to modifying several of these risk factors in underserved communities that must be addressed through culturally tailored health promotion strategies and policy changes that strengthen economic mobility, improve healthcare access and educational quality, and repair the effects of systemic racism.

Although sustained investment in developing effective therapies for ADRD is still needed, policy and funding efforts to fight ADRD should also be expanded to support enhanced community translation of research into practice and to increase our public health response to dementia in underserved communities.

A greater understanding of Alzheimer's is turning into new hope for millions of individuals and families.

But ensuring that hope reaches all families regardless of zip code, income, race and ethnicity will take intentional work, investment, and collaboration centered in health equity.

Only by understanding and addressing the challenges embedded in lived environments, including the social determinants of health, can we effectively address the disparities that impact community health. This report offers recommendations for creating such a framework. With Alzheimer's as the sixth leading cause of death for Americans, bold steps must be taken now.

RECOMMENDATIONS

To promote place-based solutions to ADRD and to promote brain health equity, we make the following eight recommendations across four areas:

COLLECT BETTER DATA TO DRIVE HEALTH EQUITY IN ADRD PUBLIC HEALTH SERVICES AND RESEARCH

- 1. Contextualize ADRD health data with social determinant data to tailor and target solutions where they are needed most.** Too often, socioeconomic research and health data are not connected, which limits understanding of the risk of developing ADRD and the timely detection of it; that synthesis is crucial for better care of underrepresented communities. Further, this data needs to be contextualized based on the lived experiences of patients and caregivers by stratifying ADRD research and surveillance datasets across socioeconomic variables, including primary language, education, annual household income, perceived social class, neighborhood characteristics, and perceived discrimination (Wilkins, et al 2020). A better understanding of the geographic and neighborhood-level ADRD challenges could lead to the tailoring of research interventions and much stronger public health promotion efforts.
- 2. Improve ADRD surveillance and monitoring efforts with a focus on geographic hot spots and high-risk populations, including Blacks, Latinos, Asian and Pacific Islanders, and American Indians and Alaska Natives.** A stronger base of knowledge is necessary to adequately inform the development of scientific research, policy, and tailored health interventions. Medicare data tell an important but incomplete story about the growing impact of ADRD on communities; important data gaps exist for Blacks, Latinos, Asian and Pacific Islanders, and American Indians and Alaska Natives as well.

INCREASE INVESTMENT IN A PUBLIC HEALTH RESPONSE TO ADRD NATIONALLY AND IN COMMUNITIES

- 1. Increase funding in support of a national public health and research infrastructure to address ADRD in highly impacted communities.** The National Institute on Aging, the Centers for Disease Control and Prevention, and local departments of public health should collaborate to evaluate and measure the impact of community-level interventions that address ADRD risk in highly impacted geographies and partner in scaling successful strategies. The National Alzheimer's Project Act Advisory Council on Alzheimer's, Research, Care, and Services has pointed out that the CDC's Healthy Brain Initiative, BOLD National Center of Public Health Excellence, and BOLD Public Health Programs should support increasing public health capacity for dementia by focusing on disparate and underserved populations. Increased investment in this approach can provide regional healthcare providers better data for evaluating their service population needs and for planning community outreach, community interventions, and stakeholder partnerships to ameliorate the effects of social determinants on brain health.

PROMOTE HEALTH EQUITY IN ADRD HEALTH SERVICES AND RESEARCH THROUGH GOAL SETTING AND QUALITY IMPROVEMENTS

- 1. Establish time-bound national goals to reduce the prevalence of ADRD and to increase the inclusion of underrepresented communities in research.** Establishing measurable, time-bound targets for dementia prevention and research inclusion can drive changes in clinical practice, public health, research and innovation—just as our country has done for heart disease, obesity, and other chronic health challenges. These goals must include a roadmap to guide the efforts, metrics to measure progress along the way, and a focus on healthcare equity that recognizes the disproportionate impact of ADRD on communities of color and women. These goals should account for the geographic impacts of ADRD and relevant social determinants of health.
- 2. Reform payment and service delivery to center equity and access in ADRD detection and treatment.** The U.S. Centers for Medicare & Medicaid Services (CMS) and private payers should make updates to the Quality Payment Program (QPP) to include measures and incentives to promote the reliable detection of cognitive impairment across subgroups and stratify performance on these measures by race, ethnicity, and gender. The Medicare and Medicaid programs should lead the way by directly incentivizing disparity reductions in ADRD detection and by explicitly including these reductions in their quality measures. Further, CMS and health plans—particularly Medicare Advantage plans—should integrate and link to programs that address the social determinants of health for both those diagnosed with ADRD and those at risk for it. Community Health Worker (CHW) training and certification programs should clearly define CHWs as a

Medicaid-reimbursable workforce for dementia response; training and certification programs should be low-or-no-cost, accessible both online and in person, and driven by CHW professional associations whenever possible (CHWs are an effective, versatile and indispensable workforce that improves health outcomes while simultaneously reducing health costs [Ruff et al., 2019]).

- 3. Invest in community health center capacity and coordination to serve high-risk communities directly, with specific strategies for improving access to brain health services and assessments in rural communities.** Federally qualified community health centers provide affordable healthcare to more than 29 million people across 12,000 urban and rural communities. It is critical for the United States to double investment in community health centers and health center look-alikes and direct efforts to lessen disparities in ADRD diagnosis, care, and research access among people of color. Similarly, we need to invest in demonstration projects for addressing dementia in rural settings through culturally sensitive telehealth solutions. Federal investment should be expanded and targeted to ensure centers are working together to expand health care capacity in vulnerable communities impacted by dementia.

INVEST IN EDUCATIONAL AND ECONOMIC OPPORTUNITY TO PROMOTE BRAIN HEALTH EQUITY

- 1. Invest in brain-health-related infrastructure and economic supports in disadvantaged and rural communities.** The private sector, including healthcare companies, should leverage its significant philanthropic giving to invest in initiatives that support brain health. These investments could yield substantial health benefits and possibly contribute to increased community resilience against ADRD. Areas investment should target include:
 - **Education:** Invest in better understanding how different educational pathways (e.g. school quality) affect brain health and how these impacts stratify across race and ethnicity. Invest in programs and policies that promote access to high-quality early childhood education.
 - **The Built Environment:** Provide increased access to well maintained parks and recreation facilities and catalyze community partnerships to improve neighborhood walkability and livability.
 - **Food Security and Quality:** Incentivize healthy food purchases among low-income Supplemental Nutrition Assistance Program (SNAP) beneficiaries. For example, explore public-private partnerships to bring farmers' markets and healthy foods to low-income neighborhoods.
- 2. Establish Workforce Policies and Protections that Promote Economic Opportunity and Resiliency in Communities.** Paid family and medical leave and paid sick days can support families at risk for or touched by ADRD, particularly the millions of women who struggle to balance work while providing dementia care. These policies can enable individuals to more easily access medical

care and services for themselves or for their loved ones ensuring economic and job security. Economic investments in underserved communities are essential to building wealth and addressing the effects of systemic discrimination on families and communities.

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Appendix

METHODOLOGY: OUR APPROACH TO SELECTING FACTORS OF INTEREST

Although there are many modifiable risk factors suggested by the literature, we focus on a limited number of factors that are often cited by researchers as closely related with ADRD, including primarily factors related to (un)healthy lifestyles and the environment. For example, researchers consider diabetes closely related with ADRD because of the observed higher risk of ADRD later in life for persons who have diabetes earlier in life (Ahtiluoto et al., 2010), and because the two disease share many biological features (Moore et al., 2015). Behaviors such as a healthy diet, exercising, and not smoking are among the key recommendations to prevent or control diabetes (e.g., Diabetes Prevention Program Research Group, 2009), and these behavioral changes are often considered strategies for modifying one's risk for cognitive decline and ADRD (Moore et al., 2015). Accordingly, we examine differences in obesity, physical inactivity, and smoking across the counties of interest. Due to their link with a healthy diet and exercise, the food environment index (a measure equally weighing limited access to healthy food and food insecurity) and access to exercise opportunities were also examined.⁹

Although not often cited among the key modifiable risk factors, research increasingly suggests that insufficient sleep may be related with higher risk of ADRD onset (de Almondes et al., 2016). While more study of the exact mechanisms connecting the two is needed, recent findings link beta-amyloid and tau protein accumulation, which are closely associated with cognitive decline, to sleep deprivation (Shokri-Kojori et al., 2018; Holth et al., 2019). Therefore, although the link of ADRD and sleep is likely bidirectional (Ju, Lucey, & Holtzman, 2014), these new findings increase the possibility that sleep-related interventions could curb the risk of ADRD onset.

Finally, air pollution has been increasingly linked with neuroinflammation and neuropathology that may lead to both neurodevelopmental disorders such as autism and neurodegenerative disorders such as Alzheimer's or Parkinson's disease (Block & Calderón-Garcidueñas, 2009; Costa et al., 2017; Levesque et al., 2011). We acknowledge this emerging evidence on the importance of air pollution by observing differences in the average annual concentration of fine particulate matter (defined as particles of air pollutants with an aerodynamic diameter less than 2.5 micrometers and measured in micrograms per cubic meter) across counties of interest.

⁹ It should be noted that, while the measure of access to exercise opportunities aims to recognize different characteristics of built environment in urban and rural areas by allowing for a larger distance from the nearest recreational facility in rural areas, its focus on parks and recreational facilities may still misrepresent exercise opportunities in rural areas as it focuses on amenities that are more commonly associated with urban areas.

SOCIOECONOMIC PROFILE

Whereas health behaviors and related environmental factors are directly linked with the prevalence of ADRD across counties, socioeconomic differences are key factors shaping people's health behaviors and determining the quality of their built environment and food environment.

Indeed, while persons from all socioeconomic strata are at risk of developing ADRD, research shows that the risk is markedly higher for poorer and less educated persons (Cadare et al., 2018). These same people are more likely to have unhealthy diets, have inadequate access to exercise opportunities, suffer from sleep deprivation, and to experience racial discrimination. In addition to inadequate resources, less flexible work schedules that make an appropriate work-life balance difficult may have an effect (Council of Economic Advisors, 2014). For example, only about two out of five workers with a high school education or lower had flexibility in scheduling their work hours compared to 55 percent of workers with a bachelor's degree or higher (ibid). Latino workers enjoyed less workplace flexibility than any other racial and ethnic group.

Educational attainment is a socioeconomic factor of particular interest because it is both a determinant of ADRD through its connection to a person's socioeconomic status, health behaviors, and environmental factors (Schüz et al., 2020) as well as a modifiable ADRD risk factor due to its positive impact on cognitive reserve – that is, resiliency to ADRD-related pathology (Stern, 2012). In short, education attainment has been the subject of substantial study and found to be linked with lower risk of ADRD (e.g., Mortimer & Graves, 1993; Larsson et al., 2017). In our analysis, educational attainment is represented with the percentage of population with at least a bachelor's degree. Other socioeconomic factors that we examine include median household income, ratio of households in the highest and lowest income brackets, percentage of families living in poverty, and percentage of population lacking health insurance.

GLOSSARY OF TERMS

Place - The physical location and environment in which one lives, grows, works and ages.

Health Disparity - A particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage.

Brain Health Equity - A commitment to reduce—and, ultimately, eliminate—disparities in cognition, Alzheimer’s and other dementias by recognizing the role of both biological and social determinants in developing equitable treatments, interventions, and access to care and research.

Prevalence - In this analysis, prevalence represents the percentage of individuals diagnosed with Alzheimer’s or a related dementia within the 2016 Medicare Fee for Service (MFFS) program.

Confidence Interval - The confidence interval (CI) is a range of values that’s likely to include a population value with a certain degree of confidence. It is often expressed a % whereby a population means lies between an upper and lower interval.

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EXPANDED COUNTY LISTINGS

Non-Latino Black									
Highest ADRD prevalence					Lowest ADRD prevalence				
State abbreviation	County name	Population	FFS Enrollment	ADRD prevalence	State abbreviation	County name	Population	FFS Enrollment	ADRD prevalence
IN	Fayette	567	80	21.3	SD	Minnehaha	8009	371	3.0
KY	Franklin	5098	814	20.4	MN	Stearns	6915	388	3.1
IA	Marshall	489	64	18.8	WI	Dane	25841	2379	3.3
NV	Lincoln	149	304	18.4	MN	Dakota	21804	711	3.4
TX	Refugio	344	106	17.9	HI	Honolulu	21714	1204	3.4
TN	Humphreys	619	73	16.4	NY	Broome	9672	785	3.4
FL	Calhoun	1921	136	16.2	WI	Brown	5389	339	3.5
LA	Jackson	4832	593	15.9	MN	Anoka	17404	716	3.6
TN	Lake	2148	146	15.8	AL	Bibb	4785	440	3.6
TX	Kleberg	1148	77	15.6	NY	Wayne	2756	421	3.8
TX	Kerr	758	138	15.2	MN	Ramsey	57937	4888	3.8
TX	Austin	2474	324	15.1	WA	Thurston	7723	860	3.8
TX	Matagorda	3782	649	14.8	GA	Lamar	5368	440	3.9
TX	Jones	2872	82	14.6	WY	Laramie	2701	327	4.0
LA	West Carroll	1808	206	14.6	MI	Ottawa	3596	273	4.0
KY	Mercer	792	110	14.5	AK	Fairbanks North Star	4006	284	4.2
GA	Candler	2620	321	14.3	MN	Hennepin	148740	10233	4.3
TX	Angelina	12798	1803	14.3	CA	Shasta	1613	301	4.3
MO	Jefferson	2225	203	14.3	RI	Providence	50508	3819	4.3
TN	Marshall	2256	250	14.0	ME	Cumberland	7493	385	4.4
TX	Morris	3049	459	13.9	PA	Luzerne	10524	767	4.4
NC	Hertford	14037	2761	13.9	CO	Boulder	2512	290	4.5
IL	Saline	838	173	13.9	MN	Olmsted	7805	310	4.5
FL	Jackson	12911	1897	13.9	WV	Berkeley	7822	1129	4.5
TN	Warren	441	195	13.8	KY	Kenton	7026	553	4.5

Latino

Highest ADRD prevalence					Lowest ADRD prevalence				
State abbreviation	County name	Population	FFS Enrollment	ADRD prevalence	State abbreviation	County name	Population	FFS Enrollment	ADRD prevalence
FL	Miami-Dade	1769174	81846	19.1	AR	Benton	39482	1160	2.3
TX	Starr	62378	6448	18.9	CO	Eagle	15710	449	2.7
TX	Reagan	2393	154	17.5	AZ	Santa Cruz	38727	1841	2.7
LA	Avoyelles	701	75	17.3	NV	Elko	12539	642	2.8
GA	Dougherty	2308	101	15.8	MN	Dakota	27153	528	2.8
TX	Terrell	542	70	15.7	SC	Lexington	15551	384	2.9
TX	Brooks	6820	844	15.6	TX	Nacogdoches	12259	377	2.9
TX	Willacy	19267	1575	15.6	IA	Woodbury	15671	604	3.0
TX	Karnes	7822	802	15.3	GA	Hall	52192	1239	3.0
TX	Jim Wells	33147	3028	15.1	WI	Rock	13201	462	3.0
KS	Haskell	1181	73	15.1	MN	Hennepin	82230	1509	3.0
PA	Lycoming	2094	93	15.1	OR	Marion	83591	2130	3.1
TX	Live Oak	4539	368	14.4	KY	Jefferson	36467	1084	3.1
TX	Duval	10255	1284	14.2	CA	Solano	109117	6540	3.1
TX	Knox	1233	106	14.2	NV	Lyon	8200	562	3.2
TX	Edwards	1099	264	14.0	AZ	Navajo	11903	772	3.2
LA	Assumption	597	81	13.6	GA	Henry	13493	485	3.3
TX	Real	660	140	13.6	NM	Torrance	6427	473	3.4
WA	Adams	11823	170	13.5	OR	Umatilla	19605	764	3.4
TX	Kleberg	22920	1469	13.5	CA	Yolo	65417	3551	3.4
NM	Los Alamos	3006	253	13.4	VA	Loudoun	48204	1319	3.4
OH	Greene	4272	97	13.4	IL	Boone	10999	435	3.4
TX	Zapata	13489	1251	13.3	CO	Montezuma	3147	347	3.5
TX	Jim Hogg	4701	559	13.2	TX	Gregg	22068	631	3.5
KS	Riley	5852	139	12.9	AZ	Maricopa	1238830	31307	3.5

Non-Latino White

Highest ADRD prevalence					Lowest ADRD prevalence				
State abbreviation	County name	Population	FFS Enrollment	ADRD prevalence	State abbreviation	County name	Population	FFS Enrollment	ADRD prevalence
KS	Clay	7904	1817	18.7	CO	Ouray	4260	848	2.7
KY	Franklin	41035	8299	18.6	AK	Yukon-Koyukuk	1193	381	2.9
SD	Faulk	2215	512	18.0	CO	Costilla	1142	452	3.1
GA	Quitman	1010	69	17.4	CO	Park	14796	2077	3.3
KS	Trego	2813	689	16.7	CO	San Miguel	6757	775	3.5
TX	Armstrong	1601	339	16.5	OH	Holmes	42828	2626	3.5
TX	Knox	2299	485	16.1	CO	Eagle	35545	3902	3.6
IL	Saline	22637	5586	16.0	MT	Mineral	4109	1175	3.7
KS	Gove	2497	670	15.7	NV	Eureka	1701	300	3.7
TX	Hansford	2965	680	15.4	NM	Catron	2788	1003	3.7
KS	Hodgeman	1725	383	15.4	CO	Gilpin	4915	459	3.7
NV	Lincoln	4273	1649	15.3	CO	Summit	23825	2660	3.8
TX	Sterling	752	144	15.3	WA	Ferry	5638	1571	3.8
TX	Crane	1654	290	15.2	ID	Teton	8444	1088	3.9
TX	Limestone	14011	2647	15.0	NM	Taos	11701	3538	3.9
OK	Harmon	1685	456	14.9	CO	Conejos	3581	531	4.0
MS	Sharkey	1189	423	14.9	CO	Saguache	3597	887	4.1
IL	Hardin	3873	956	14.9	ID	Lemhi	7240	2341	4.1
NE	McPherson	413	83	14.5	CO	Lake	4648	667	4.2
GA	Taliaferro	600	139	14.4	MT	Jefferson	10812	2075	4.2
TX	Martin	2862	409	14.2	NM	Rio Arriba	5110	1670	4.3
NY	Kings	933253	108310	14.2	AZ	Apache	13456	2852	4.3
GA	Brooks	8949	1322	14.1	AZ	Santa Cruz	7122	2590	4.3
MO	Henry	20636	4657	14.1	CO	Dolores	1651	443	4.3
TX	Brooks	383	156	14.1	TX	Jeff Davis	1379	392	4.3

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