**Unveiling the Trends: Growing Atrial Fibrillation and Dementia related Mortality in Older Adults in the United States, 2000-2020**

Muhammad Umer Sohail (1)\*, Ruqiat Masooma Batool (1)\*, Muhammad Saad (1), Saad Ahmed Waqas (1), Muhammed Ameen Noushad (2), Muhammad Ovais Sohail (3), Matthew Bates (4), Raheel Ahmed (5), David Ripley (6,7)

\* **Co-first Authors**

**From:** Department of Medicine, Dow University of Health Sciences, Karachi, Pakistan (1); University Hospitals Plymouth NHS Trust, UK (2); Conemaugh Memorial Medical Center, Johnstown, PA, USA (3); James Cook University Hospital, Middlesbrough, UK (4); National Heart and Lung Institute, Imperial College London, London, United Kingdom (5); Northumbria Hospitals NHS Foundation Trust, UK (6); University of Sunderland, UK (7)

**Competing Interests**: The authors have no conflicts of interest to declare.**Funding**: No funding was received for this study.**Ethical Approval**: Ethical approval was not required for this study.

**Correspondence:** Dr Raheel Ahmed; National Heart and Lung Institute, Imperial College London, London, United Kingdom; R.ahmed21@imperial.ac.uk

**Total Word Count:** 3552(excluding references)

**Abstract:**

**Background:** Atrial fibrillation (AF) and dementia are increasingly prevalent in aging U.S. populations. Their association raises public health concerns, emphasizing the need to understand mortality trends in older adults. This study examines AF and dementia-related mortality trends from 2000 to 2020.

**Methods:** Using the CDC WONDER Multiple Cause of Death database, we analyzed death certificates for individuals aged 65 and older, reporting age-adjusted mortality rates (AAMRs) per 100,000 persons. Trends were assessed through annual percent change (APC) analysis via Joinpoint regression, with stratifications by sex, race/ethnicity, urbanization, and Census regions.

**Results:** A total of 400,103 AF and dementia-related deaths were recorded between 2000 and 2020. The AAMR increased markedly from 25.4 in 2000 to 70.4 in 2020. The overall AAMR showed a steady increase from 2000 to 2018 (APC: +4.4%; 95% CI: 3.7–4.8), with a sharper rise from 2018 to 2020 (APC: +9.5%; 95% CI: 4.5–12.2; p < 0.001). Mortality rates were comparable between men (AAMR: 72.7) and women (AAMR: 71.6). NH White individuals exhibited the highest AAMR (47.0), followed by NH Black (26.6), Hispanic (23.1), and NH Asian/Pacific Islander (18.0) populations. Nonmetropolitan areas had higher AAMRs (48.1) compared to metropolitan areas (43.5). Regionally, the Western U.S. recorded the highest AAMR at 48.2, while state-level disparities showed a nearly threefold difference between the top 90th and bottom 10th percentiles.

**Conclusion:** Rising AF and dementia-related mortality rates among older adults highlight a need for targeted screening and intervention, particularly for high-risk demographics and underserved regions.

**Keywords:** Atrial Fibrillation; Dementia; Mortality Trends; Older Adults; CDC WONDER Database

1. **INTRODUCTION**

Atrial fibrillation (AF) is the most prevalent sustained arrhythmia globally1, with its incidence and prevalence expected to rise dramatically in the coming decades. Estimates indicate that by 2050, AF will affect up to 15.9 million individuals in the United States (U.S.) alone, driven largely by the aging population 2–4. AF predominantly impacts individuals over 655, with nearly 70% of cases occurring in those aged 65 to 856, and approximately 10% of people older than 80 affected7. Similarly, dementia poses a growing public health challenge worldwide, with projections suggesting that the incidence will double with every 5.9-year increase in age. By 2030, over 75 million people worldwide will be living with dementia, and this number is expected to surpass 135 million by 20508. Together, AF and dementia represent a significant health and economic burden, especially in aging populations.

There is a well-documented association between AF and an elevated risk of cognitive impairment and dementia9,10. A large meta-analysis reported that AF is associated with a 39% increase in the risk of cognitive impairment among the general population11. Increasing research efforts are shedding light on the complex interplay between AF and dementia, including shared pathophysiological mechanisms, therapeutic management strategies, and outcomes12,13. Studies have shown that mortality rates related to both AF14 and dementia15 are rising, yet the specific trends in AF and Dementia related mortality among older adults in the U.S. remain unclear. This study aims to examine mortality trends associated with AF and dementia among older adults from 2000 to 2020. Utilizing data from the U.S. Centers for Disease Control and Prevention’s (CDC) Wide-Ranging Online Data for Epidemiologic Research (WONDER) system, our analysis focuses on variations across sex, race, urbanization, and geographic regions to provide a comprehensive understanding of these intersecting health concerns.

1. **MATERIALS AND METHODS**

**2.1 Study Setting and Population**  
This descriptive study examined mortality data derived from death certificates using the CDC WONDER database. The primary objective was to analyze trends in mortality rates related to AF and dementia among individuals aged 65 and older over the period from 2000 to 2020.

We focused on records within the Multiple Cause of Death (MCD) Public Use dataset, which encompasses mortality causes across all 50 U.S. states and the District of Columbia. This dataset is widely utilized in mortality trend research. To identify AF, we used ICD-10 code I48, and for dementia, we applied ICD-10 codes F01, F03, and G30 as contributing causes of death. These codes have been validated in prior studies using the CDC WONDER database to accurately capture AF and dementia-related mortalities14,15. Additionally, we conducted a sensitivity analysis to examine deaths where dementia was specifically listed as a contributing cause of death.

As this study utilized de-identified, publicly accessible data from a government database, it did not require institutional review board (IRB) approval. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

**2.2 Data Abstraction**  
Data were stratified by demographic and geographic characteristics, including gender, race/ethnicity, urbanization level, census region, and state of residence. Racial and ethnic classifications were defined as Hispanic or Latino, Non-Hispanic (NH) White, and NH Black/African American, using categories from death certificate data commonly applied in previous WONDER database analyses16.

Urban-rural status was assigned according to the National Center for Health Statistics (NCHS) Urban-Rural Classification Scheme, categorizing counties as urban (large metropolitan areas with populations over 1 million and medium/small metropolitan areas with populations between 50,000 and 999,999) or rural (populations under 50,000), as per the 2013 U.S. Census17. Geographic regions were classified into Northeast, Midwest, South, and West, following U.S. Census Bureau guidelines18.

**2.3 Statistical Analysis**  
To assess national trends in AF and dementia-related mortalities, we calculated crude mortality rates (CMRs) and age-adjusted mortality rates (AAMRs) per 100,000 individuals, standardizing to the year 2000 U.S. population as the baseline18. CMRs were obtained by dividing AF and dementia-related deaths by the U.S. population of each year, while AAMRs were adjusted to the 2000 baseline.

To evaluate changes in mortality rates over time, we employed the Joinpoint Regression Program (Version 5.2.0, National Cancer Institute)19. This program uses log-linear regression models to estimate the annual percent change (APC) in AAMR along with a 95% confidence interval (CI). APCs were classified as increasing or decreasing based on their deviation from a null hypothesis of zero change, with statistical significance set at P < 0.05, using a two-tailed t-test. Additionally, a parallelism test was conducted to determine if trends across different groups were statistically similar or distinct; a significant P-value in this test indicated a meaningful difference between average annual percent change (AAPC) trends across groups20.

1. **RESULTS**

A total of 400,103 AF and dementia-related deaths among older adults (aged ≥65 years) occurred between 2000 and 2020. Information on the location of death was available for 376,857 deaths. Of these, 55.1% occurred in nursing homes/long-term care facilities, 21.9% in medical facilities, 18.0% at the decedent’s home, and 4.9% in hospices **(Supplemental Table 1)**.

**3.1 Annual Trends for AF and Dementia-Related Mortality**  
The AAMR for AF and dementia-related deaths in older adults increased markedly from 25.4 in 1999 to 70.4 in 2020. The overall AAMR rose consistently from 2000 to 2018 (APC: +4.4%; 95% CI: 3.7 to 4.8), followed by an accelerated increase from 2018 to 2020 (APC: +9.5%; 95% CI: 4.5 to 12.2), highlighting a substantial rise in recent years **(Figure 1, Supplemental Table 2)**. When compared to mortalities related to dementia alone, trends for AF and dementia-related mortalities turned out to be significantly different (p < 0.001) **(Table 1, Supplemental Figure 1)**.

**3.2 AF and Dementia-Related Mortality Trends Stratified by Gender**

Trends in mortalities differed by gender (p < 0.001). The overall AAMR was 44.4 (95% CI: 44.2 to 44.6) for older men and 43.9 (95% CI: 43.8 to 44.1) for older women **(Table 1)**. For older men, the AAMR increased from 24.4 in 2000 to 72.7 in 2020, showing a steady rise from 2000 to 2018 (APC: +4.4%; 95% CI: 3.7 to 4.8) and a sharper increase from 2018 to 2020 (APC: +11.6%; 95% CI: 5.8 to 14.4). For older women, the AAMR rose from 29.4 in 2000 to 71.6 in 2020, with an initial rise from 2000 to 2013 (APC: +4.7%; 95% CI: 4.3 to 5.9), a slower increase from 2013 to 2018 (APC: +2.4%; 95% CI: -0.4 to 3.7), and an accelerated rise from 2018 to 2020 (APC: +10.8%; 95% CI: 6.4 to 14.1) **(Figure 1, Supplemental Table 2)**.

**3.3 AF and Dementia-Related Mortality Trends Stratified by Race**

The overall AAMR was highest among NH White adults (47.0; 95% CI: 46.8 to 47.1), followed by NH Black/African American adults (26.6; 95% CI: 26.2 to 27.0), Hispanic adults (23.1; 95% CI: 22.7 to 23.5), and NH Asian/Pacific Islander adults (18.0; 95% CI: 17.5 to 18.5) **(Table 1)**.

NH White adults experienced a steady increase from 2000 to 2018 (APC: +4.4%; 95% CI: 2.4 to 6.9), with a sharper rise from 2018 to 2020 (APC: +9.5%; 95% CI: 4.6 to 12.2). Among NH Black/African American adults, the AAMR rose from 2000 to 2013 (APC: +4.9%; 95% CI: 4.2 to 10.2), slowed from 2013 to 2018, and then rose notably from 2018 to 2020 (APC: +18.8%; 95% CI: 10.3 to 25.6). Hispanic adults showed an increase from 2000 to 2014 (APC: +7.0%; 95% CI: 6.2 to 9.1), plateaued from 2014 to 2018 (APC: -0.02%; 95% CI: -5.25 to 3.49), and sharply increased from 2018 to 2020 (APC: +21.2%; 95% CI: 12.6 to 28.4). NH Asian/Pacific Islander adults had the lowest rates, with an initial rise from 2000 to 2010 (APC: +5.1%; 95% CI: 3.6 to 24.1), a minimal rise from 2010 to 2018 (APC: 1.3%; 95% CI: -7.0 to 2.9), and an increase from 2018 to 2020 (APC: +18.7%; 95% CI: 7.4 to 26.8) **(Figure 2, Supplementary Table 2).**

The Hispanic population exhibited a significantly larger rise compared to other racial groups (p < 0.001 vs. NH Asian/Pacific Islander, NH Black/African American, and NH White). In contrast, all other comparisons showed nonsignificant results in the test for parallelism (p > 0.3) **(Table 1)**.

**3.4 AF and Dementia-Related Mortality Trends Stratified by Geography**

A significant difference in AAMRs was observed in different states, with the AAMRs ranging from 20.3 (95% CI: 19.1 to 21.5) in Nevada to 82.5 (95% CI: 80.9 to 84.1) in Oregon. States that fell into the top 90th percentile were Oregon, Minnesota, Vermont, Washington, and South Carolina, which had almost triple the AAMRs compared with states that fell into the lower 10th percentile, namely, Nevada, Florida, District of Columbia, Arizona, and Louisiana **(Figure 3, Supplemental Table 3)**. On average, over the course of the study period, the highest mortality was observed in the Western (AAMR: 48.2; 95% CI: 47.9 to 48.5), followed by the Midwestern (AAMR: 46.5; 95% CI: 46.2 to 46.7), Southern (AAMR: 43.4; 95% CI: 43.1 to 43.6), and Northeast (AAMR: 39.3; 95% CI: 39.0 to 39.6) regions **(Table 1, Supplemental Figure 2, Supplemental Table 4)**.

Nonmetropolitan areas exhibited a higher AAMR than metropolitan areas. (p < 0.001) **(Table 1)**. The AAMR was 48.1 (95% CI: 47.7 to 48.4) for nonmetropolitan areas and 43.5 (95% CI: 43.3 to 43.6) for metropolitan areas. In nonmetropolitan areas, AAMRs rose consistently at an APC of +4.9% (95% CI: 2.4 to 8.6) from 2000 to 2018, accelerating to +12.3% (95% CI: 5.2 to 16.0) between 2018 and 2020. In metropolitan areas, AAMRs increased steadily, with an APC of +4.6% (95% CI: 4.1 to 9.4) from 2000 to 2013, followed by a slower rise of +2.5% (95% CI: -0.68 to 3.9) between 2013 and 2018, and a sharp increase to +11.3% (95% CI: 6.1 to 15.2) from 2018 to 2020 **(Figure 4, Supplemental Table 5)**.

1. **DISCUSSION**

This 20-year analysis of CDC WONDER data analyzed mortality trends in people with concomitant AF and Dementia. Our findings indicate a consistent increase in mortality from 1999 to 2018, followed by a steeper increase till 2020, underscoring a concerning rise across all demographics. Mortality rates were markedly higher among NH Whites compared to NH African Americans, with men experiencing slightly elevated rates compared to women. Notable geographic disparities were also identified: non-metropolitan areas exhibited higher mortality rates than metropolitan areas, and mortality was highest in the Western region. Additionally, states within the top 90th percentile of AAMRs demonstrated nearly triple the mortality rates than states in the bottom 10th percentile. These results have important public health policy implications.

The association between AF and dementia is well-supported in current literature, reinforcing our findings. A large U.S. cohort study of 37,025 older adults found that AF independently correlates with an increased risk of developing dementia, as well as elevated mortality rates among those with both AF and dementia compared to those with dementia alone21. Furthermore, In a study by Zhang et al., which followed 433,746 participants over a median period of 12.6 years, individuals with AF exhibited a substantially elevated risk of developing dementia compared to those without AF22. Several mechanisms may underlie this association. The irregular rhythm of AF can lead to cerebral hypoperfusion, which may predispose to the chronic deposition of amyloid-beta (Aβ42), contributing to senile plaque formation23 while thrombus formation results in silent cerebral infarcts24. Furthermore, AF is linked to microinfarcts and cerebral hemorrhages25, which are associated with cognitive decline. AF is also accompanied by elevated levels of inflammatory markers—such as C-reactive protein (CRP), tumor necrosis factor-alpha (TNF-α), and interleukins 2, 6, and 8—which correlate with cognitive deterioration and progression to dementia26. Additionally, AF significantly raises the risk of thromboembolic events, increasing the likelihood of ischemic stroke by four- to five-fold27, a recognized risk factor for dementia28.

We observed a consistent upward trend in mortality, which aligns with findings from Kouki et al., who documented a rise in AF and dementia-related deaths during the study period from 2011 to 201729. The increasing mortality rates among older adults with concurrent AF and dementia can be attributed to several interrelated factors. The demographic shift toward a growing older population in the U.S. is critical30, as this cohort is particularly susceptible to rising cardiometabolic risk factors such as hypertension, diabetes, and obesity. These conditions are becoming more prevalent and are linked to elevated all-cause and cardiovascular mortality risks in patients with both AF and dementia31. Cerebral thromboembolism plays a significant role as a primary cause of death in dementia patients31, with AF further increasing the likelihood of stroke and other cardiovascular events31. Additionally, the rising prevalence of comorbidities such as heart failure and chronic kidney disease32 exacerbates mortality outcomes31.

Despite increasing awareness of dementia in recent years, the condition remains globally underdiagnosed and is often identified only at advanced stages of the disease process resulting in poor prognosis33. This underdiagnosis is compounded by patients’ elevated risk of complications, such as mobility impairments, which contribute to increased mortality rates34. Similarly, global awareness of AF is limited, with only 48% of the population recognizing the condition, further complicating timely diagnosis and management35 resulting in elevated mortality rates.

Meanwhile, significant advancements in diagnostic procedures over the past few years have enhanced the ability to detect dementia through radiological and nuclear neuroimaging techniques, including magnetic resonance imaging (MRI), computed tomography (CT), positron emission tomography (PET), and single-photon emission computed tomography (SPECT)36. Furthermore, the last decade has witnessed considerable progress in identifying biomarkers of diagnostic and prognostic significance for dementia, including amyloid-beta (Aβ42β40) and phosphorylated tau (p-tau181), Neurofilament light (NfL) protein and glial fibrillary acidic protein (GFAP) 37. These developments have led to increased detection and diagnosis of dementia, which may result in higher reported deaths.

Our findings indicate similar mortality trends in patients with AF and Dementia for both genders, with men exhibiting slightly higher mortality rates. Previous studies suggest older women may have a higher incidence of AF and dementia due to the loss of estrogen’s protective effect38, along with a greater prevalence of hypertension and diabetes39 and less frequent use of DOACs40, which provide protective effects on cognitive function and a reduced risk of AF-related dementia41. Our findings, indicating a slightly higher AAMR for men, may be attributed to the increased fatality of AF when combined with other cardiovascular conditions, which are more prevalent in older men42. This observation aligns with Ptack et al.'s prediction of higher mortality risks in men with coexisting AF and dementia, highlighting a possible cumulative effect on fatality rates in this demographic43. Given these nuances, further research is essential to clarify gender-based differences in AF-related mortality.

Our results also highlight important racial and ethnic disparities in patients. Throughout the study period, mortality trends remained highest in White individuals compared to their Black counterparts. A meta-analysis44 incorporating data from the ARIC and CHS studies indicated that a 10% increase in European ancestry was associated with a 13% higher risk of AF44. The factors identified to explain racial disparities in AF may also help clarify disparities in AF-dementia comorbidity, given the established link between AF and dementia. This observation aligns with the widely studied phenomenon known as the “AF race paradox,” which describes the lower prevalence of AF in Black individuals compared to Whites despite a higher prevalence of modifiable risk factors such as obesity, hypertension, and diabetes among Black populations45.

Genetic factors are thought to play a key role in these disparities. For instance, genetic variability at the PITX2 locus has been associated with AF, and specific single-nucleotide polymorphisms (SNPs) within this locus have shown links to dementia in Caucasian populations46. One study highlighted that a protective minor allele of a PITX2-related SNP is more prevalent in Black individuals47, accounting for 11.4% to 31.7% of the reduced AF risk in this group. This genetic distinction may partially explain the higher incidence and mortality associated with AF in Whites. Detection methods and structural differences also contribute to these racial disparities. White men, on average, have a larger left atrium compared to Black men, leading to a form of chronic AF that may be more readily detectable in Whites48. Black individuals, on the other hand, may experience under-detection of AF, partly due to population studies that do not adequately capture paroxysmal or asymptomatic AF episodes49. Additionally, Black individuals face lower awareness of their AF and dementia diagnosis, often due to reduced health literacy50, limited access to healthcare, and provider bias51, all of which further exacerbate disparities in health outcomes52.

Significant geographical disparities in AF dementia related mortality rates reveal unique challenges faced by rural populations. First, rural residents may experience a higher risk for the development of AF due to risk factors such as smoking, hypertension, diabetes, and obesity, compared to urban counterparts, which collectively increase their susceptibility to developing dementia53. Second, limited awareness and self-management pose challenges, as many rural individuals have less knowledge of AF and its implications54. This limited awareness is compounded by restricted access to specialty care, high medication costs, and a shortage of emergency transport55. The "invisibility" of AF, wherein symptoms are not readily apparent to others, adds a layer of isolation, making rural patients more reliant on interpersonal support and technology for self-care—strategies that may not suffice for optimal disease management55. Third, rural regions experience substantial shortages of healthcare providers, particularly specialists such as electrophysiologists, which often leads patients to rely on urgent care rather than specialized treatment56. As a result, rural patients are less likely to receive DOACs, further impacting their quality of care and outcome57. Finally, financial barriers add another layer of complexity, as rural populations are more likely to rely on Medicare and Medicaid, limiting their access to copayment discounts and other forms of financial assistance available to commercially insured patients58. Being underinsured or reliant on public insurance can significantly hinder access to necessary medications, specialized consultations, and continuous care, thereby intensifying health disparities59.

Evidence suggests that AF patients on oral anticoagulants face a significantly lower risk of developing dementia compared to those who do not receive anticoagulation therapy60. This finding underscores the critical role of consistent anticoagulant use in effective AF management. Additionally, rhythm-control strategies, such as catheter ablation and cardioversion, not only stabilize heart rhythm but may also enhance cerebral perfusion, potentially preventing the onset of dementia61. Addressing modifiable risk factors through lifestyle modifications is equally crucial. Antihypertensive therapies62 and lipid-lowering agents like atorvastatin and ezetimibe have shown efficacy in preserving neurocognitive function in older AF patients63. Encouraging regular physical activity, maintaining a balanced diet, and engaging in cognitive stimulation can further support brain health and help mitigate cognitive decline associated with AF64. Moreover, expanding the role of the CHA2DS2-VASc score in early risk stratification can aid in identifying high-risk patients65, facilitating more targeted and effective care. Legislative initiatives aimed at increasing funding for emergency medical services in rural areas are also essential, as they can improve access to advanced AF management and reduce disparities in care55. Lastly, ensuring consistent adherence to established clinical guidelines for anticoagulation therapy, ventricular rate control, and effective management of comorbid cardiac conditions across all states and regions could help reduce geographic disparities in the treatment and outcomes of AF and dementia66,67.

It is essential to monitor patients with elevated CHA2DS2-VASc scores closely for early signs of cognitive impairment68. Implementing integrated screening algorithms that evaluate both AF and mild cognitive impairment can facilitate timely interventions69. Future research should prioritize the development of accessible and sensitive biomarkers for vascular dementia, given the limitations of MRI in reliably predicting early disease progression70. Additionally, more trials should evaluate the effectiveness of various anticoagulation and rhythm-control strategies68,71, with an emphasis on ensuring adequate representation of ethnic and racial minorities to better understand differential outcomes64. Investigating the cognitive effects of different anticoagulants and exploring the potential benefits of anti-inflammatory agents, such as statins, could yield valuable insights into mitigating cognitive decline linked to systemic inflammation in AF patients72.  Additionally, increasing public awareness regarding early detection and prevention strategies will empower patients to seek timely care13.  This can be done through utilizing consumer-grade devices, such as smartphone-paired monitors and smartwatches, which may present a valuable opportunity due to their high sensitivity and specificity for detecting atrial fibrillation13,73. It is suggested that developing a more streamlined system with a user-friendly interface and extended battery life would be particularly beneficial for older adults, facilitating long-term monitoring and support for at-risk populations74. This study has several limitations. First, reliance on ICD-10 codes from death certificates may lead to misclassification of AF and dementia, impacting mortality trends. Second, the CDC WONDER database lacks clinical detail on patients' cardiovascular risk profiles, comorbidities, and disease severity, as well as socioeconomic variables like income, education, and insurance, limiting insight into disparities in care access and outcomes. Third, advancements in medical treatments over the 2000-2020 period are not accounted for, potentially influencing trends. Lastly, the data's cross-sectional, aggregate nature restricts analysis of individual-level, longitudinal relationships between AF, dementia, and mortality.

**Conclusion:**

This study underscores the rising trends in AF- and dementia-related mortality in the U.S. from 2000 to 2020. AAMRs were similar between men and women, with the highest mortality observed among non-Hispanic whites. Mortality rates were notably elevated in nonmetropolitan areas and in the Western U.S. region. Our findings highlight the potential of early anticoagulation therapy to reduce cognitive decline in AF patients and the importance of early detection and screening of AF through consumer-grade technologies, such as smartwatches and smartphones, to help address the increasing burden of mortality.

**FIGURE LEGENDS**

**Figure 1.** Overall and sex-stratified atrial fibrillation and dementia-related AAMRs per 100,000 in older adults in the United States from 2000 to 2020.

**Figure 2.** Atrial fibrillation and dementia -related AAMRs per 100,000 stratified by race in older adults in the United States from 2000 to 2020.

**Figure 3.** Atrial fibrillation and dementia -related AAMRs per 100,000 stratified by state in older adults in the United States from 2000 to 2020.

**Figure 4.** Atrial fibrillation and dementia -related AAMRs per 100,000 stratified by urbanization in older adults in the United States from 2000 to 2020.

**REFERENCES:**

1. Kornej J, Börschel CS, Benjamin EJ, Schnabel RB. Epidemiology of Atrial Fibrillation in the 21st Century. *Circ Res*. 2020;127:4–20.

2. Miyasaka Y, Barnes ME, Gersh BJ, Cha SS, Bailey KR, Abhayaratna WP, Seward JB, Tsang TSM. Secular trends in incidence of atrial fibrillation in Olmsted County, Minnesota, 1980 to 2000, and implications on the projections for future prevalence. *Circulation*. 2006;114:119–125.

3. Lakshminarayan K, Solid CA, Collins AJ, Anderson DC, Herzog CA. Atrial fibrillation and stroke in the general medicare population: a 10-year perspective (1992 to 2002). *Stroke*. 2006;37:1969–1974.

4. Tsao CW, Aday AW, Almarzooq ZI, Anderson CAM, Arora P, Avery CL, Baker-Smith CM, Beaton AZ, Boehme AK, Buxton AE, Commodore-Mensah Y, Elkind MSV, Evenson KR, Eze-Nliam C, Fugar S, Generoso G, Heard DG, Hiremath S, Ho JE, Kalani R, Kazi DS, Ko D, Levine DA, Liu J, Ma J, Magnani JW, Michos ED, Mussolino ME, Navaneethan SD, Parikh NI, Poudel R, Rezk-Hanna M, Roth GA, Shah NS, St-Onge M-P, Thacker EL, Virani SS, Voeks JH, Wang N-Y, Wong ND, Wong SS, Yaffe K, Martin SS, American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee. Heart Disease and Stroke Statistics-2023 Update: A Report From the American Heart Association. *Circulation*. 2023;147:e93–e621.

5. Wasmer K, Eckardt L, Breithardt G. Predisposing factors for atrial fibrillation in the elderly. *J Geriatr Cardiol JGC*. 2017;14:179–184.

6. Feinberg WM, Blackshear JL, Laupacis A, Kronmal R, Hart RG. Prevalence, age distribution, and gender of patients with atrial fibrillation. Analysis and implications. *Arch Intern Med*. 1995;155:469–473.

7. Go AS, Hylek EM, Phillips KA, Chang Y, Henault LE, Selby JV, Singer DE. Prevalence of diagnosed atrial fibrillation in adults: national implications for rhythm management and stroke prevention: the AnTicoagulation and Risk Factors in Atrial Fibrillation (ATRIA) Study. *JAMA*. 2001;285:2370–2375.

8. Prince M, Bryce R, Albanese E, Wimo A, Ribeiro W, Ferri CP. The global prevalence of dementia: A systematic review and metaanalysis. *Alzheimers Dement*. 2013;9:63-75.e2.

9. Kalantarian S, Stern TA, Mansour M, Ruskin JN. Cognitive impairment associated with atrial fibrillation: a meta-analysis. *Ann Intern Med*. 2013;158:338–346.

10. Kwok CS, Loke YK, Hale R, Potter JF, Myint PK. Atrial fibrillation and incidence of dementia. *Neurology*. 2011;76:914–922.

11. Koh YH, Lew LZW, Franke KB, Elliott AD, Lau DH, Thiyagarajah A, Linz D, Arstall M, Tully PJ, Baune BT, Munawar DA, Mahajan R. Predictive role of atrial fibrillation in cognitive decline: a systematic review and meta-analysis of 2.8 million individuals. *EP Eur*. 2022;24:1229–1239.

12. Testai FD, Gorelick PB, Chuang P-Y, Dai X, Furie KL, Gottesman RF, Iturrizaga JC, Lazar RM, Russo AM, Seshadri S, Wan EY, on behalf of the American Heart Association Stroke Council; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; Council on Cardiovascular and Stroke Nursing; and Council on Hypertension. Cardiac Contributions to Brain Health: A Scientific Statement From the American Heart Association. *Stroke*.;0. doi:10.1161/STR.0000000000000476.

13. Rivard L, Friberg L, Conen D, Healey JS, Berge T, Boriani G, Brandes A, Calkins H, Camm AJ, Yee Chen L, Lluis Clua Espuny J, Collins R, Connolly S, Dagres N, Elkind MSV, Engdahl J, Field TS, Gersh BJ, Glotzer TV, Hankey GJ, Harbison JA, Georg Haeusler K, Hills MT, Johnson LSB, Joung B, Khairy P, Kirchhof P, Krieger D, Lip GYH, Løchen M-L, Madhavan M, Mairesse GH, Montaner J, Ntaios G, Quinn TJ, Rienstra M, Rosenqvist M, Sandhu RK, Smyth B, Schnabel RB, Stavrakis S, Themistoclakis S, Van Gelder IC, Wang J-G, Freedman B. Atrial Fibrillation and Dementia: A Report From the AF-SCREEN International Collaboration. *Circulation*. 2022;145:392–409.

14. Ghajar A, Essa M, DeLago A, Parvez A, Aryan Z, Shalhoub J, Hammond-Haley M, Hartley A, Sargsyan V, Salciccioli J, Faridi KF, Nazarian S, Philips B. Atrial fibrillation/atrial flutter related mortality trends in the US population 2010–2020: Regional, racial, sex variations. *Pacing Clin Electrophysiol*. 2023;46:519–525.

15. Ali M, Talha M, Naseer B, Jaka S, Gunturu S. Divergent Mortality Patterns Associated With Dementia in the United States: 1999–2020. *Prim Care Companion CNS Disord*. 2024;26:56364.

16. Multiple Cause of Death, 1999-2020 Request. Available at https://wonder.cdc.gov/mcd-icd10.html. Accessed November 6, 2024.

17. Aggarwal R, Chiu N, Loccoh EC, Kazi DS, Yeh RW, Wadhera RK. Rural-Urban Disparities: Diabetes, Hypertension, Heart Disease, and Stroke Mortality Among Black and White Adults, 1999-2018. *J Am Coll Cardiol*. 2021;77:1480–1481.

18. Ingram DD, Franco SJ. 2013 NCHS Urban-rural Classification Scheme for Counties. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics; 2014: 1-88.

19. Joinpoint Regression Program. Available at https://surveillance.cancer.gov/joinpoint/. Accessed November 6, 2024.

20. Kim H-J, Fay MP, Yu B, Barrett MJ, Feuer EJ. Comparability of Segmented Line Regression Models. *Biometrics*. 2004;60:1005–1014.

21. Bunch TJ, Weiss JP, Crandall BG, May HT, Bair TL, Osborn JS, Anderson JL, Muhlestein JB, Horne BD, Lappe DL, Day JD. Atrial fibrillation is independently associated with senile, vascular, and Alzheimer’s dementia. *Heart Rhythm*. 2010;7:433–437.

22. Zhang W, Liang J, Li C, Gao D, Ma Q, Pan Y, Wang Y, Xie W, Zheng F. Age at Diagnosis of Atrial Fibrillation and Incident Dementia. *JAMA Netw Open*. 2023;6:e2342744.

23. Hardy J, Allsop D. Amyloid deposition as the central event in the aetiology of Alzheimer’s disease. *Trends Pharmacol Sci*. 1991;12:383–388.

24. Petersen P, Madsen EB, Brun B, Pedersen F, Gyldensted C, Boysen G. Silent cerebral infarction in chronic atrial fibrillation. *Stroke*. 1987;18:1098–1100.

25. Diener H-C, Hart RG, Koudstaal PJ, Lane DA, Lip GYH. Atrial Fibrillation and Cognitive Function: JACC Review Topic of the Week. *J Am Coll Cardiol*. 2019;73:612–619.

26. Guo Y, Lip GYH, Apostolakis S. Inflammation in atrial fibrillation. *J Am Coll Cardiol*. 2012;60:2263–2270.

27. Bassand J-P, Accetta G, Camm AJ, Cools F, Fitzmaurice DA, Fox KAA, Goldhaber SZ, Goto S, Haas S, Hacke W, Kayani G, Mantovani LG, Misselwitz F, ten Cate H, Turpie AGG, Verheugt FWA, Kakkar AK, for the GARFIELD-AF Investigators. Two-year outcomes of patients with newly diagnosed atrial fibrillation: results from GARFIELD-AF. *Eur Heart J*. 2016;37:2882–2889.

28. Livingston G, Huntley J, Sommerlad A, Ames D, Ballard C, Banerjee S, Brayne C, Burns A, Cohen-Mansfield J, Cooper C, Costafreda SG, Dias A, Fox N, Gitlin LN, Howard R, Kales HC, Kivimäki M, Larson EB, Ogunniyi A, Orgeta V, Ritchie K, Rockwood K, Sampson EL, Samus Q, Schneider LS, Selbæk G, Teri L, Mukadam N. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *The Lancet*. 2020;396:413–446.

29. Kouki E, Salmela B, Aro A, Halminen O, Teppo K, Haukka J, Putaala J, Linna M, Mustonen P, Hartikainen J, Airaksinen JKE, Lehto M. Temporal trends in mortality and causes of death in patients with incident atrial fibrillation: a nationwide register study from 2010 to 2018. *BMJ Open*. 2024;14:e080836.

30. Bureau UC. U.S. Older Population Grew From 2010 to 2020 at Fastest Rate Since 1880 to 1890. Census.gov. Available at https://www.census.gov/library/stories/2023/05/2020-census-united-states-older-population-grew.html. Accessed November 6, 2024.

31. Chen Y-Y, Lin Y-J, Hsieh Y-C, Chien K-L, Lin C-H, Chung F-P, Chen S-A. Atrial fibrillation as a contributor to the mortality in patients with dementia: A nationwide cohort study. *Front Cardiovasc Med*. 2023;10:1082795.

32. House AA, Wanner C, Sarnak MJ, Piña IL, McIntyre CW, Komenda P, Kasiske BL, Deswal A, deFilippi CR, Cleland JGF, Anker SD, Herzog CA, Cheung M, Wheeler DC, Winkelmayer WC, McCullough PA, Conference Participants. Heart failure in chronic kidney disease: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. *Kidney Int*. 2019;95:1304–1317.

33. To Know or Not to Know: Causes and Evolution of Lack of Awareness of Cognitive Decline in Neurodegenerative Diseases | Frontiers Research Topic. Available at https://www.frontiersin.org/research-topics/19986/to-know-or-not-to-know-causes-and-evolution-of-lack-of-awareness-of-cognitive-decline-in-neurodegenerative-diseases. Accessed November 7, 2024.

34. Lisko I, Kulmala J, Annetorp M, Ngandu T, Mangialasche F, Kivipelto M. How can dementia and disability be prevented in older adults: where are we today and where are we going? *J Intern Med*. 2021;289:807–830.

35. Wendelboe AM, Raskob GE, Angchaisuksiri P, Blanco AN, Büller H, Ddungu H, Dvorak JD, Hunt BJ, Hylek EM, Kakkar A, Konstantinides SV, McCumber M, McLintock C, Urano T, Weitz JI. Global public awareness about atrial fibrillation. *Res Pract Thromb Haemost*. 2017;2:49.

36. Hnilicova P, Kantorova E, Sutovsky S, Grofik M, Zelenak K, Kurca E, Zilka N, Parvanovova P, Kolisek M. Imaging Methods Applicable in the Diagnostics of Alzheimer’s Disease, Considering the Involvement of Insulin Resistance. *Int J Mol Sci*. 2023;24:3325.

37. Stocker H, Beyer L, Perna L, Rujescu D, Holleczek B, Beyreuther K, Stockmann J, Schöttker B, Gerwert K, Brenner H. Association of plasma biomarkers, p-tau181, glial fibrillary acidic protein, and neurofilament light, with intermediate and long-term clinical Alzheimer’s disease risk: Results from a prospective cohort followed over 17 years. *Alzheimers Dement J Alzheimers Assoc*. 2023;19:25–35.

38. Ali N, Sohail R, Jaffer SR, Siddique S, Kaya B, Atowoju I, Imran A, Wright W, Pamulapati S, Choudhry F, Akbar A, Khawaja UA. The Role of Estrogen Therapy as a Protective Factor for Alzheimer’s Disease and Dementia in Postmenopausal Women: A Comprehensive Review of the Literature. *Cureus*. 2023;15:e43053.

39. Naseri MW, Esmat HA, Bahee MD. Prevalence of hypertension in Type-2 diabetes mellitus. *Ann Med Surg*. 2022;78:103758.

40. Yong CM, Tremmel JA, Lansberg MG, Fan J, Askari M, Turakhia MP. Sex Differences in Oral Anticoagulation and Outcomes of Stroke and Intracranial Bleeding in Newly Diagnosed Atrial Fibrillation. *J Am Heart Assoc*. 2020;9:e015689.

41. Mavaddat N, Roalfe A, Fletcher K, Lip GYH, Hobbs FDR, Fitzmaurice D, Mant J. Warfarin Versus Aspirin for Prevention of Cognitive Decline in Atrial Fibrillation. *Stroke*. 2014;45:1381–1386.

42. Ott A, Breteler MMB, de Bruyne MC, van Harskamp F, Grobbee DE, Hofman A. Atrial Fibrillation and Dementia in a Population-Based Study. *Stroke*. 1997;28:316–321.

43. Garcia-Ptacek S, Farahmand B, Kåreholt I, Religa D, Cuadrado ML, Eriksdotter M. Mortality Risk after Dementia Diagnosis by Dementia Type and Underlying Factors: A Cohort of 15,209 Patients based on the Swedish Dementia Registry. *J Alzheimers Dis*. 2014;41:467–477.

44. Marcus GM, Alonso A, Peralta CA, Lettre G, Vittinghoff E, Lubitz SA, Fox ER, Levitzky YS, Mehra R, Kerr KF, Deo R, Sotoodehnia N, Akylbekova M, Ellinor PT, Paltoo DN, Soliman EZ, Benjamin EJ, Heckbert SR, Candidate-Gene Association Resource (CARe) Study. European ancestry as a risk factor for atrial fibrillation in African Americans. *Circulation*. 2010;122:2009–2015.

45. Lipworth L, Okafor H, Mumma MT, Edwards TL, Roden DM, Blot WJ, Darbar D. Race-specific impact of atrial fibrillation risk factors in blacks and whites in the southern community cohort study. *Am J Cardiol*. 2012;110:1637–1642.

46. Rollo J, Knight S, May HT, Anderson JL, Muhlestein JB, Bunch TJ, Carlquist J. Incidence of dementia in relation to genetic variants at PITX2, ZFHX3, and ApoE ε4 in atrial fibrillation patients. *Pacing Clin Electrophysiol PACE*. 2015;38:171–177.

47. Stamos TD, Darbar D. The “Double” Paradox of Atrial Fibrillation in Black Individuals. *JAMA Cardiol*. 2016;1:377–379.

48. Psaty BM, Manolio TA, Kuller LH, Kronmal RA, Cushman M, Fried LP, White R, Furberg CD, Rautaharju PM. Incidence of and risk factors for atrial fibrillation in older adults. *Circulation*. 1997;96:2455–2461.

49. Soliman EZ, Prineas RJ. The paradox of atrial fibrillation in African Americans. *J Electrocardiol*. 2014;47:804–808.

50. Lin P-J, Emerson J, Faul JD, Cohen JT, Neumann PJ, Fillit HM, Daly AT, Margaretos N, Freund KM. Racial and Ethnic Differences in Knowledge about One’s Dementia Status. *J Am Geriatr Soc*. 2020;68:1763.

51. van Ryn M, Fu SS. Paved with good intentions: do public health and human service providers contribute to racial/ethnic disparities in health? *Am J Public Health*. 2003;93:248–255.

52. Lau C-P, Gbadebo TD, Connolly SJ, Van Gelder IC, Capucci A, Gold MR, Israel CW, Morillo CA, Siu C-W, Abe H, Carlson M, Tse H-F, Hohnloser SH, Healey JS, ASSERT investigators. Ethnic differences in atrial fibrillation identified using implanted cardiac devices. *J Cardiovasc Electrophysiol*. 2013;24:381–387.

53. Essien UR, Kornej J, Johnson AE, Schulson LB, Benjamin EJ, Magnani JW. Social determinants of atrial fibrillation. *Nat Rev Cardiol*. 2021;18:763–773.

54. Lip GYH, Kamath S, Jafri M, Mohammed A, Bareford D. Ethnic differences in patient perceptions of atrial fibrillation and anticoagulation therapy: the West Birmingham Atrial Fibrillation Project. *Stroke*. 2002;33:238–242.

55. Mann HK, Streiff M, Schultz KC, Halpern DV, Ferry D, Johnson AE, Magnani JW. Rurality and Atrial Fibrillation: Patient Perceptions of Barriers and Facilitators to Care. *J Am Heart Assoc*. 2023;12:e031152.

56. Singh SM, Webster L, Ko DT, Tu JV, Wijeysundera HC. Factors Associated With Cardiac Electrophysiologist Assessment and Catheter Ablation Procedures in Patients With Atrial Fibrillation. *JACC Clin Electrophysiol*. 2017;3:302–309.

57. Norby FL, Lutsey PL, Shippee ND, Chen LY, Henning-Smith C, Alonso A, Walker RF, Folsom AR. Direct Oral Anticoagulants and Warfarin for Atrial Fibrillation Treatment: Rural and Urban Trends in Medicare Beneficiaries. *Am J Cardiovasc Drugs Drugs Devices Interv*. 2022;22:207–217.

58. Foutz J, Artiga S, Published RG. The Role of Medicaid in Rural America. KFF. Available at https://www.kff.org/medicaid/issue-brief/the-role-of-medicaid-in-rural-america/. Accessed November 7, 2024.

59. Shortage of emergency responders is a crisis in Pennsylvania. WITF. Available at https://www.witf.org/2023/02/21/shortage-of-emergency-responders-is-a-crisis-in-pennsylvania/. Accessed November 7, 2024.

60. Kim D, Yang P-S, Yu HT, Kim T-H, Jang E, Sung J-H, Pak H-N, Lee M-Y, Lee M-H, Lip GYH, Joung B. Risk of dementia in stroke-free patients diagnosed with atrial fibrillation: data from a population-based cohort. *Eur Heart J*. 2019;40:2313–2323.

61. Efimova I, Efimova N, Chernov V, Popov S, Lishmanov Y. Ablation and Pacing: Improving Brain Perfusion and Cognitive Function in Patients with Atrial Fibrillation and Uncontrolled Ventricular Rates. *Pacing Clin Electrophysiol*. 2012;35:320–326.

62. Manolis TA, Manolis AA, Apostolopoulos EJ, Melita H, Manolis AS. Atrial Fibrillation and Cognitive Impairment: An Associated Burden or Burden by Association? *Angiology*. 2020;71:498–519.

63. Lappegård KT, Pop-Purceleanu M, van Heerde W, Sexton J, Tendolkar I, Pop G. Improved neurocognitive functions correlate with reduced inflammatory burden in atrial fibrillation patients treated with intensive cholesterol lowering therapy. *J Neuroinflammation*. 2013;10:844.

64. Morley JE. Mild cognitive impairment-a treatable condition. *J Am Med Dir Assoc*. 2014;15:1–5.

65. Harb SC, Wang TKM, Nemer D, Wu Y, Cho L, Menon V, Wazni O, Cremer PC, Jaber W. CHA2DS2-VASc score stratifies mortality risk in patients with and without atrial fibrillation. *Open Heart*. 2021;8. doi:10.1136/openhrt-2021-001794.

66. January CT, Wann LS, Alpert JS, Calkins H, Cigarroa JE, Cleveland JC, Conti JB, Ellinor PT, Ezekowitz MD, Field ME, Murray KT, Sacco RL, Stevenson WG, Tchou PJ, Tracy CM, Yancy CW, ACC/AHA Task Force Members. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines and the Heart Rhythm Society. *Circulation*. 2014;130:e199-267.

67. European Heart Rhythm Association, European Association for Cardio-Thoracic Surgery, Camm AJ, Kirchhof P, Lip GYH, Schotten U, Savelieva I, Ernst S, Van Gelder IC, Al-Attar N, Hindricks G, Prendergast B, Heidbuchel H, Alfieri O, Angelini A, Atar D, Colonna P, De Caterina R, De Sutter J, Goette A, Gorenek B, Heldal M, Hohloser SH, Kolh P, Le Heuzey J-Y, Ponikowski P, Rutten FH. Guidelines for the management of atrial fibrillation: the Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). *Eur Heart J*. 2010;31:2369–2429.

68. Papanastasiou CA, Theochari CA, Zareifopoulos N, Arfaras-Melainis A, Giannakoulas G, Karamitsos TD, Palaiodimos L, Ntaios G, Avgerinos KI, Kapogiannis D, Kokkinidis DG. Atrial Fibrillation Is Associated with Cognitive Impairment, All-Cause Dementia, Vascular Dementia, and Alzheimer’s Disease: a Systematic Review and Meta-Analysis. *J Gen Intern Med*. 2021;36:3122–3135.

69. Manolis TA, Manolis AA, Apostolopoulos EJ, Melita H, Manolis AS. Atrial Fibrillation and Cognitive Impairment: An Associated Burden or Burden by Association? *Angiology*. 2020;71:498–519.

70. Lombardi G, Crescioli G, Cavedo E, Lucenteforte E, Casazza G, Bellatorre A-G, Lista C, Costantino G, Frisoni G, Virgili G, Filippini G. Structural magnetic resonance imaging for the early diagnosis of dementia due to Alzheimer’s disease in people with mild cognitive impairment. *Cochrane Database Syst Rev*. 2020;3:CD009628.

71. Bunch TJ. Atrial Fibrillation and Dementia. *Circulation*. 2020;142:618–620.

72. Varrias D, Saralidze T, Borkowski P, Pargaonkar S, Spanos M, Bazoukis G, Kokkinidis D. Atrial Fibrillation and Dementia: Pathophysiological Mechanisms and Clinical Implications. *Biomolecules*. 2024;14:455.

73. Smartwatches and Atrial Fibrillation: What Works and What Needs Improvement? American College of Cardiology. Available at https://www.acc.org/Latest-in-Cardiology/Articles/2024/05/29/16/56/http%3a%2f%2fwww.acc.org%2fLatest-in-Cardiology%2fArticles%2f2024%2f05%2f29%2f16%2f56%2fSmartwatches-and-Atrial-Fibrillation. Accessed November 7, 2024.

74. Ding EY, CastañedaAvila M, Tran K-V, Mehawej J, Filippaios A, Paul T, Otabil EM, Noorishirazi K, Han D, Saczynski JS, Barton B, Mazor KM, Chon K, McManus DD. Usability of a smartwatch for atrial fibrillation detection in older adults after stroke. *Cardiovasc Digit Health J*. 2022;3:126.

**Table 1. Age-Adjusted Mortality Rate Trend in US Subjects With Atrial Fibrillation and Dementia, 2000 to 2020**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Deaths** | **AAMR 2000 (95% CI)** | **AAMR 2020 (95% CI)** | **AAPC (95% CI)** | **P (for parallelism)** |
| **Dementia in Total vs AF Population** |  |  |  |  | **p < 0.001** |
| **Dementia in Total Population** | 6,367,889 | 581.7 (579.2 to 584.2) | 855.1 (852.6 to 857.7) | +1.5% (1.1 to 1.9) |  |
| **Dementia in AF Population** | 400,103 | 25.4 (24.9 to 26.0) | 70.4 (69.7 to 71.1) | +4.7% (4.2 to 5.0) |  |
| **Gender** |  |  |  |  | **p < 0.001** |
| **Men** | 143,515 | 24.4 (23.5 to 25.3) | 72.7 (71.6 to 73.9) | +5.1% (4.6 to 5.4) |  |
| **Women** | 256,588 | 25.7 (25.1 to 26.4) | 68.3 (67.4 to 69.2) | +4.7% (4.4 to 5.0) |  |
| **Non-Hispanic Race** |  |  |  |  |  |
| **NH Asian/Pacific Islander** | 5,336 | 11.5 (9.0 to 14.6) | 27.5 (25.4 to 29.5) | +4.8% (4.1 to 6.9) | NH Asian/Pacific Islander vs NH White: p = 0.75 |
| **NH Black/African American** | 18,685 | 15.8 (14.3 to 17.3) | 45.2 (43.3 to 47.2) | +5.3% (4.8 to 6.1) | NH Black vs NH Asian/Pacific Islander: p = 0.33 |
| **NH White** | 375,103 | 26.6 (26.1 to 27.2) | 75.6 (74.8 to 76.4) | +4.9% (4.3 to 5.2) | NH White vs NH Black individuals: p = 0.46 |
| **Hispanic** | 12,154 | 9.6 (7.9 to 11.3) | 39.7 (37.8 to 41.7) | +6.8% (6.3 to 7.8) | Hispanic vs NH White: **p < 0.001** Hispanic vs NH Black: **p < 0.001** Hispanic vs NH Asian/Pacific Islander: **p < 0.001** |
| **Urbanization** |  |  |  |  | **p < 0.001** |
| **Metropolitan** | 322,977 | 25.5 (24.9 to 26.1) | 67.6 (66.9 to 68.4) | +4.7% (4.3 to 5.2) |  |
| **Nonmetropolitan** | 77,126 | 25.3 (24.1 to 26.5) | 84.0 (82.0 to 85.9) | +5.6% (4.9 to 6.2) |
| **Census Region** |  |  |  |  |  |
| **Northeast** | 34872 | 24.5 (23.4 to 25.6) | 63.9 (62.4 to 65.5) | +4.4% (4.0 to 4.9) | … |
| **Midwest** | 46207 | 26.7 (25.6 to 27.8) | 78.9 (77.2 to 80.5) | +5.1% (4.4 to 5.5) | … |
| **South** | 64758 | 23.3 (22.4 to 24.2) | 69.7 (68.5 to 70.9) | +5.2% (4.9 to 5.6) | … |
| **West** | 51616 | 28.9 (27.6 to 30.2) | 68.4 (66.9 to 69.9) | +4.2% (3.6 to 4.8) | … |