Cardiovascular prevention

Clinical research

Trends of cardiovascular disease-related mortality in individuals with intellectual disability and developmental disorders (1999–2023): a CDC WONDER Database Analysis

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Submitted: 20 September 2025; **Accepted:** 4 January 2026
Online publication: 25 May 2026

Arch Med Sci Atheroscler Dis 2026;
DOI: https://doi.org/10.5114/amsad/216366
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Abstract

Introduction: Individuals with intellectual and developmental disabilities (IDD) are subjected to significant health disparities, including an increased risk of cardiovascular disease (CVD). This study examines national trends in CVD-related mortality among individuals with IDD in the United States from 1999 to 2023.

Material and methods: Records of both IDD- and CVD-related deaths were retrospectively analysed using the Centers for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research (CDC WONDER) database. Crude and age-adjusted mortality rates (AAMRs) per 100,000 population and annual percent changes (APCs) in age-adjusted mortality rate were determined and measured across different demographics in the U.S.

Results: Between 1999 and 2023, a total of 26,463 CVD deaths occurred among individuals with IDD in the U.S., with higher mortality in males (55.6%) and non-Hispanic Whites (77.2%). Most deaths were in urban areas (73.9%) and the South (33.3%), primarily among those aged ≥ 55 years. The overall AAMR declined from 0.419 to 0.221 per 100,000, with the sharpest drop from 2021 to 2023 (APC: –13.04%). Females saw a greater decline (APC: –3.22%) than males. Significant reductions were observed across racial/ethnic groups, and while rural areas had higher AAMRs, only urban areas showed significant improvement (APC: –2.58%). State-level AAMRs ranged from 0.027 (Nevada) to 0.882 (North Dakota).

Conclusions: Despite overall declines in cardiovascular mortality among individuals with IDD, persistent disparities by sex, race, and geography highlight the need for targeted prevention strategies.

Key words: cardiovascular disease, CDC WONDER, intellectual and developmental disabilities.

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Introduction

Cardiovascular diseases (CVD) represent a major health challenge worldwide. Recognising their effects on vulnerable populations such as people with intellectual disability and developmental disorders, is pivotal for targeted interventions and working on improving the healthcare outcomes. This is crucial because this population usually remains under-represented in research and is often overlooked by policy frameworks.

These developmental disorders and intellectual disability include a range of conditions specified by notable limitations in both functioning and adaptive behaviour, which impact the various aspects of daily life [1].

The prevalence of intellectual disability is approximated to be between 1% and 5% of the general public, highlighting the significance of conveying the specific health needs of this group [2]. This population often experiences a higher risk of additional conditions, including physical disabilities, mental health problems, and communication disorders which contribute to increased health risk [3]. However, the evidence highlighting these facts is still sparse and inconsistently reported.

The junction of intellectual disability and cardiovascular health is an area of growing concern. These individuals may face unique challenges in accessing health care, sticking to preventive measures, and handling cardiovascular risk [4]. Cardiovascular disease is a crucial contributor to the increasing public health epidemic in chronic diseases [5]. Keeping in mind the population of aging adults with intellectual disabilities, it is becoming important to assess age-associated health risks, and most importantly the cardiovascular risks [6].

Several factors such as a sedentary lifestyle, poor dietary habits, and long-term use of medication may play a role in the elevated risk of CVD-related deaths in this population [7]. Along with these communication barriers and gaps in health literacy hinder early management and compound the risk of unfortunate outcomes in these individuals.

Despite these concerns, health surveillance has not highlighted the full burden of CVD among this population. This gap hampers the equal allocation of resources and designing of the data-based interventions. It is critical to address this disparity and ensure individuals with intellectual and developmental disabilities (IDD) are being represented and taken care of. This project aims to examine the trends and patterns of cardiovascular death specific to this group to improve disease prevention strategies, promote health equity, and ensure special attention is paid to these individuals to ultimately reduce the deaths in this segment specifically and generally in the overall population.

Material and methods

Study design

This study uses an epidemiological approach to examine trends in cardiovascular-related mortality with IDD in the United States. Data were retrieved from the Center for Disease Control and Prevention (CDCWONDER) database. This platform is publicly available and provides mortality data from 1999 to 2023 [8]. The data are available online and are accessible, so institutional review board approval was not obtained. Cases were linked according to International Bracket of conditions 10th modification (ICD-10) canons. The canons included in this study are F70-79 (intellectual disabilities), F80-89 (experimental diseases), and F99 (unidentified internal diseases).

Data extraction

The death instruments for the data of mortality were collected by National Center for Health Statistics (NCHS). This includes data for different variables including time of death, coitus, race, geographic region, place of death, and civic-pastoral bracket. Age was stratified into standard 10- year intervals as 5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and 85+ years. Race was defined using the US Census Bureau Brackets, which include non-Hispanic (NH) American Indian or Alaska Native (available until 2020), NH Asian or Pacific Islander, NH Black or African American, NH White, and Hispanic [9]. The orders for place of death were inpatient medical family, inpatient or exigency department, stiff's home, lodge family, nursing home, nursing home/long-term care, and other settings. The 2013 Urbanisation scheme was used to determine urbanicity.

Statistical analysis

We calculated the age-adjusted mortality rates (AAMRs) and crude mortality rates per 100,000 population. To make the comparison across the sub-groups the AAMRs were standardised to the US Standard Population [10–14]. We performed analysis according to sub-groups of age, sex, race, region, and urban-rural classification, to identify disparities [11]. Temporal trends were determined using Jointpoint Regression Program version 5.3. Jointpoint identifies the significant trends by presenting a log-transformed mortality rate instead of sires of linear line segments. We can use this model to determine the optimal locations and number.

The annual percentage change (APC) and average annual percentage changes (AAPC) were

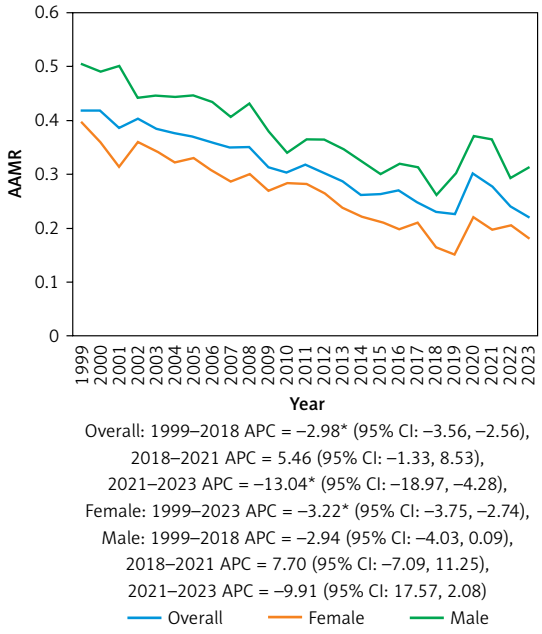

Figure 1. Trends in age-adjusted cardiovascular disease (CVD) mortality rates per 100,000 among patients with intellectual and developmental disabilities in the United States, stratified by sex, 1999–2023

*APC – annual percentage change, CI – confidence interval. *Indicates that the annual percentage change (APC) is significantly different from zero at α = 0.05.*

also calculated with 95% confidence interval. The trend was considered statistically significant if the *p*-value was < 0.05.

Results

Overall mortality distribution by demographic and geographic variables (1999–2023)

Between 1999 and 2023, a total of 26,463 CVD-related deaths occurred among individuals with IDD in the United States. Of these, 55.6% were reported among males (*n* = 14,704) and 44.4% among females (*n* = 11,759). By race and ethnicity, the majority of deaths were recorded among non-Hispanic White individuals (77.2%, *n* = 20,422), followed by non-Hispanic Black or African American individuals (24.7%, *n* = 3638), Hispanic or Latino individuals (6.3%, *n* = 1665), non-Hispanic Asian or Pacific Islander individuals (*n* = 299), and non-Hispanic American Indian or Alaska Native individuals (*n* = 104; through 2020 only).

Regional analysis revealed that the South accounted for the highest proportion of CVD-related deaths among individuals with IDD (33.3%, *n* = 8815), followed by the Midwest (27.2%, *n* = 7194), Northeast (20.5%, *n* = 5430), and West (19.0%, *n* = 5024). In terms of urbanisation, the majority of deaths occurred in urban areas (*n* = 19,561), whereas rural areas reported 6902 deaths.

The distribution of deaths across age groups showed a concentration in older adults. Individuals aged 55–64 years and those aged 65–74 years accounted for 21.9% (*n* = 5805) and 21.5% (*n* = 5692) of deaths, respectively, followed closely by those aged 75–84 years (21.5%, *n* = 5692). Other age groups included individuals aged 45–54 years (13.8%, *n* = 3660), 35–44 years (7.3%, *n* = 1940), 85 years and older (7.2%, *n* = 1907), 25–34 years (4.7%, *n* = 1251), 15–24 years (4.0%, *n* = 1063), and 5–14 years (2.1%, *n* = 553).

Analysis of place of death indicated that the most common location was medical facility -inpatient, where 33.1% of deaths occurred (*n* = 8756). This was followed by deaths in nursing homes or long-term care facilities (29.6%, *n* = 7838), decedent's home (17.1%, *n* = 4536), and medical facilities -outpatient or emergency departments (12.1%, *n* = 3194). Additionally, 5.0% of deaths occurred in other or unspecified locations (*n* = 1336), and 1.6% occurred in hospice facilities (*n* = 421).

Overall age-adjusted mortality trends (1999–2023)

The overall AAMR for CVD among individuals with IDD decreased significantly over the 25-year study period. The overall AAMR declined from 0.419 per 100,000 (95% CI: 0.395–0.443) in 1999 to 0.231 (95% CI: 0.215–0.248) in 2018, representing a statistically significant APC of –2.98% (95% CI: –3.56 to –2.56). Following a plateau and minor fluctuation, a sharp and significant decline was observed again from 0.279 (95% CI: 0.262–0.297) in 2021 to 0.221 (95% CI: 0.207–0.236) in 2023 (APC: –13.04%; 95% CI: -18.97 to -4.28). Notably, this final two-year decline was the most pronounced reduction observed during the entire study period (Supplementary Table SI, Supplementary Figures S1, S2; Figure 1).

Demographic trends

Gender-stratified trends

Although females accounted for 44.4% of cardiovascular deaths, males consistently exhibited higher AAMRs across all years. However, the decline in mortality was more pronounced among females. The AAMR among females decreased significantly from 0.398 (95% CI: 0.366–0.431) in 1999 to 0.183 (95% CI: 0.162–0.203) in 2023 (APC: –3.22%; 95% CI: –3.75 to –2.74). In contrast, males started with a higher AAMR of 0.505 (95% CI: 0.465–0.545) in 1999 and ended at 0.314 (95% CI: 0.288–0.341) in 2023 (Supplementary Table SII; Figure 1).

Race/ethnicity-stratified trends

Non-Hispanic Black individuals experienced a significant decline in AAMR from 0.495 (95% CI: 0.411–0.578) in 1999 to 0.338 (95% CI: 0.283–0.393) in 2023 (APC: –1.78%; 95% CI: –2.52 to –1.03). Hispanic or Latino individuals also showed a significant reduction from 0.229 (95% CI: 0.161–0.315) to 0.119 (95% CI: 0.090–0.153) (APC: –1.74%; 95% CI: –3.01 to –0.28). Among non-Hispanic White individuals, the decline was more substantial during the earlier part of the period, with AAMRs dropping from 0.442 (95% CI: 0.414–0.470) in 1999 to 0.251 (95% CI: 0.229–0.273) in 2017 (APC: –3.01%; 95% CI: –6.91 to –0.63). This decline among non-Hispanic Whites was the steepest among all racial/ethnic groups, but it plateaued after 2017 (Supplementary Table SIII; Figure 2).

Geographic trends

Urbanization

A total of 19,561 cardiovascular-related deaths (73.9%) occurred in urban areas, while 6902 deaths (26.1%) occurred in rural areas. Despite the higher number of deaths in urban settings, the AAMR was consistently higher in rural areas. From 1999 to 2020, the average AAMR in rural areas was 0.491 per 100,000 (95% CI: 0.448–0.533), compared to 0.288 per 100,000 (95% CI: 0.267–0.310) in urban areas.

Urban areas exhibited a significant and sustained decline in AAMR from 0.388 (95% CI: 0.362–0.414) in 1999 to 0.269 (95% CI: 0.251–0.288) in 2020 (APC: –2.58%; 95% CI: –3.21 to –1.99). In contrast, although rural areas consistently showed higher AAMRs, no statistically significant trends were observed. (Supplementary Table SV; Figure 4).

U.S. Census Regions

The South accounted for the highest number of cardiovascular-related deaths (n = 8,815; 33.3%), followed by the Midwest (n = 7,194; 27.2%), Northeast (n = 5,430; 20.5%), and West (n = 5,024; 19.0%). However, when considering risk-adjusted rates, the highest average AAMR over the study period was observed in the Midwest at 0.391 per 100,000 (95% CI: 0.356–0.425), followed by the Northeast at 0.343 (95% CI: 0.316–0.371), South at 0.286 (95% CI: 0.260–0.311), and West at 0.274 (95% CI: 0.256–0.291).

All four census regions showed statistically significant declines in AAMR between 1999 and 2023. The Midwest experienced the most pronounced reduction, with the AAMR falling from 0.521 (95% CI: 0.465–0.577) to 0.226 (95% CI: 0.194–0.259) (APC: –2.89%; 95% CI: –3.48 to –2.35). The South also showed a notable decline from 0.427 (95% CI: 0.386–0.468) to 0.212 (95% CI: 0.188–0.236) (APC: –2.73%; 95% CI: –3.33 to –2.14), followed by the Northeast, which declined from 0.453

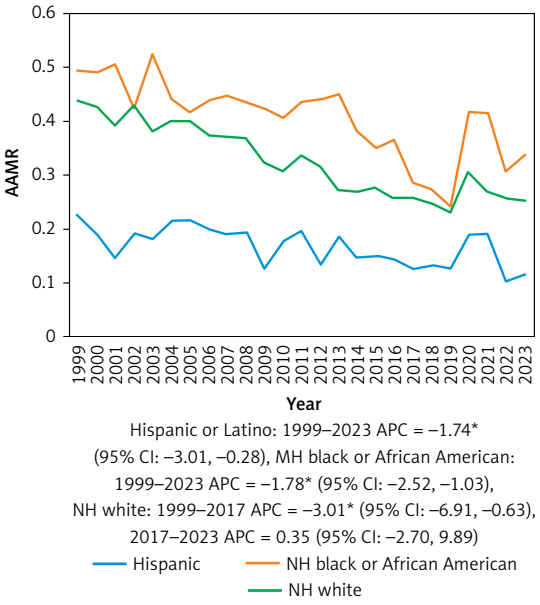

Figure 2. Trends in age-adjusted cardiovascular disease (CVD) mortality rates per 100,000 among patients with intellectual and developmental disabilities in the United States, stratified by Race, 1999–2023

*APC – annual percentage change, CI – confidence interval. *Indicates that the annual percentage change (APC) is significantly different from zero at α = 0.05.*

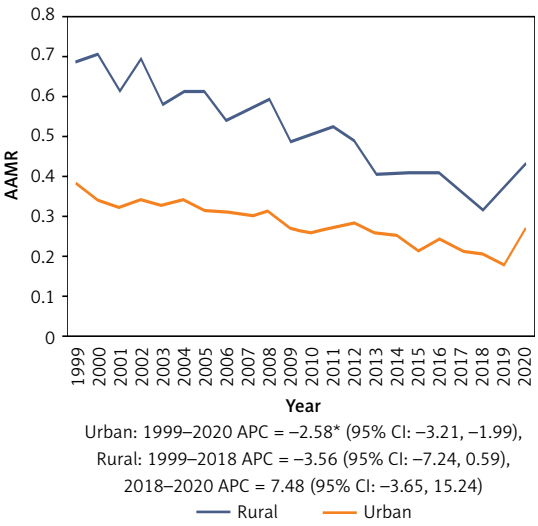

Figure 3. Trends in age-adjusted cardiovascular disease (CVD) mortality rates per 100,000 among patients with intellectual and developmental disabilities in the United States, stratified by 2013 urbanisation, 1999–2023

*APC – annual percentage change, CI – confidence interval. *Indicates that the annual percentage change (APC) is significantly different from zero at α = 0.05.*

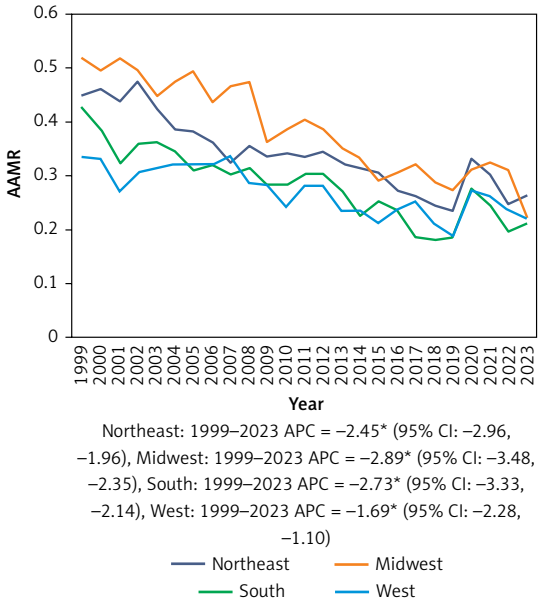

Figure 4. Trends in age-adjusted cardiovascular disease (CVD) mortality rates per 100,000 among patients with intellectual and developmental disabilities in the United States, stratified by census region, 1999–2023

*APC – annual percentage change, CI – confidence interval. *Indicates that the annual percentage change (APC) is significantly different from zero at α = 0.05.*

(95% CI: 0.397–0.510) to 0.263 (95% CI: 0.225–0.302) (APC: –2.45%; 95% CI: –2.96 to –1.96). The West had the smallest yet statistically significant reduction, from 0.339 (95% CI: 0.292–0.386) to 0.222 (95% CI: 0.190–0.253) (APC: –1.69%; 95% CI: –2.28 to –1.10) (Supplementary Table SIV; Figure 3).

State-level trends

Marked variation was observed in AAMRs across U.S. states. The highest AAMR was recorded in North Dakota, with 0.882 per 100,000, followed by states such as West Virginia (0.671), Nebraska (0.572), Iowa (0.556), and Ohio (0.563), all of which ranked in the 90th percentile or above.

In contrast, the lowest AAMRs were observed in Nevada (0.027), Arizona (0.104), and Washington (0.147) – states that fell within the bottom 10th percentile (Supplementary Table SVI).

Discussion

Our investigation of CDC data for 25 years has demonstrated a significant decrease in CVD-related mortality among individuals with IDD from 1999 to 2023. Despite these declining trends, males and non-Hispanic White individuals consistently exhibited the highest mortality trend across all years. Additionally, the South and metropolitan areas also showed the highest mortality burden. The greatest proportion of deaths were seen in older individuals, especially those aged 55–64 years and 65–74 years. At the state level, North Dakota showed the highest overall trend, whereas Nevada showed the lowest overall trend. Most deaths occurred in medical facilities, particularly in in-patient settings.

Past literature presented even more alarming cardiovascular health outcomes for people with IDD. Literature from the late 20th century indicated a constant or increasing percentage of deaths attributed to cardiovascular health issues in this population, in comparison to significant improvement in the general population. Adults with mild to moderate disabilities, living in community settings, were especially at risk, often exhibiting higher percentages of obesity, hypertension, abnormal cholesterol levels, and insulin resistance. Poor diet and inadequate exercise were considered risk factors, which were found to be more common in settings with less supervision. Compounding the problem, access to screening and preventative health care was absent or minimal, which resulted in a high prevalence of undiagnosed or poorly managed health. Down syndrome, once thought to be less susceptible to consequent atherosclerosis, experienced many of the same attributable risk factors to CVD while living in community settings (i.e., central obesity, low HDL cholesterol, and metabolic derangements). Although some evidence can be found that this sub-population has a lower incidence of ischaemic heart disease than the general population, the current understanding is mixed, and further research is needed [12].

Recent international evidence reveals that adults with an intellectual and developmental disability are subjected to greater risks of acquiring cardiovascular-related diseases. This condition was established with a population-based cohort in Denmark in 2023, which examined more than two million individuals between 1978 and 2016, regarding the time from birth until 2018. According to the researchers, individuals with intellectual disability (ID) were more likely to develop CVD earlier in life, during childhood, and early in adulthood. The study also provides that the association remains even when those with neurodevelopmental and neurological comorbidity are eliminated. This supposes that there is an independent association of intellectual disability with cardiovascular risk. Also, this study showed increased odds of CVD according to the severity of intellectual disability, awarding it a probable dose-response association [13]. While these findings were based on an alternate healthcare system, they reinforce global challenges in achieving equitable cardiovascular prevention and care for members of this

population. These findings also serve as a valuable comparison to newer US-based trends that demonstrate declining cardiovascular mortality and further highlight the urgent need for early, proactive, and inclusive public health initiatives.

Moreover, a 2024 retrospective cohort study performed in Korea by Cho *et al.* reported a 1.7-fold increased risk of CVD in individuals with intellectual disabilities, along with a 4.2-fold higher risk of death due to these conditions, particularly due to ischaemic stroke and circulatory diseases, even after adjusting for the confounders [14], which also contrasts with our study.

Consistent with our findings, a 2018 cohort study in the Netherlands of older adults with intellectual disabilities noted a lower cardiovascular mortality in this population. The study reported the primary cause of death was respiratory, mainly pneumonia, followed by neoplasms, and CVD is lower down in the rankings. In adults with Down syndrome, causes thought to be cardiovascular were uncommon, but dementia and respiratory disease were more frequent [15]. These results highlight the significant questions of under-reporting, variation in health surveillance systems, and potential biological factors that could affect cardiovascular outcomes within particular subgroups. These findings raise important questions about potential underreporting, differences in health surveillance systems, and possible biologically determined factors that may influence cardiovascular outcomes in specific subgroups. This study adds context to the finding in our study of declining cardiovascular mortality in the United States, in that it is likely that mortality trends for individuals with IDD differ based on population, care model, and the time being studied. Nevertheless, the main message remains the same, i.e. that there is a great need for continued research, early intervention, and public health campaigns that address the particular cardiovascular-related risks in this population.

In light of these global and historical research results, giving context to our findings of trends in aspects of US mortality from 1999 to 2023 is essential. Our analysis indicates a consistent decrease in cardiovascular-related mortality among people with IDD. The continued state of global mortality risk relative to enhanced US context to enhance mortality risk hints at the role of preventive care opportunities, early intervention, and greater public health initiatives. These trends call for ongoing and holistic means to combat cardiovascular health for this group.

Despite an overall reduction in mortality, males still had the highest mortality rate over the entire period. A Swedish national retrospective cohort study from 2002 to 2015 similarly described the highest overall mortality in males with intellectual disabilities, and circulatory diseases as the foremost contributing cause of this excess mortality. Although our data indicated a decrease in cardiovascular-related mortality over time, the Swedish study underscores the large burden of circulatory conditions underlying male mortality in this group [16].

However, a Finnish study by Arvio *et al.* tells a different story: females with intellectual disabilities had a higher standardised mortality ratio (SMR) than males, both with mild or severe ID. Several studies reported that CVD is one of the leading causes of death among individuals with ID, especially females, whereas it is only the second and fifth most common cause of death in the general male and female Finnish population, respectively. This may indicate the gender-based disparities in mortality [17].

Enlarging the scope beyond national statistics, an international expert consultation on mortality trends conducted in 2020 involving experts from nine countries gives a wider perspective on mortality trends in people with intellectual disabilities based on gender. The consultation noted that rates of premature mortality are often higher in females with intellectual disabilities compared to their male counterparts. However, the gender difference due to CVD risk is inconsistent. Some studies suggest women with intellectual disabilities are at increased risk of CVD, whereas others suggest no gender discrimination. Moreover, for patients newly started on antipsychotics, females are at increased risk of developing venous thromboembolism. These findings underscore the importance of additional detailed, cause-specific mortality research within this group [18].

While several European studies and our results present gender-related differences in mortality among people with intellectual disabilities, a study in the US listed heart disease as the primary cause of death in both genders, with no significant gender differences [19]. These inconsistencies may be due to variations in healthcare access, social support, or gender-based discrimination, which are not fully understood or studied. To address these gaps, it is important to investigate these factors further, and to develop effective and equitable gender-focused health measures, ensuring fairness.

In our study, mortality from CVD in adults with IDD was greatest in non-Hispanic Whites followed by non-Hispanic Blacks and non-Hispanic Latinos. This racial breakdown is contrary to some earlier studies indicating that health disparities in persons with IDD overwhelmingly impact racial and ethnic minorities.

For instance, a study by Magana *et al.* reported worse health outcomes in Black and Latino individuals with IDD as compared to their White

counterparts. These disparities were more pronounced when comparing individuals with IDD to nondisabled individuals of the same racial group [20]. However, this study does not focus on the underlying cause of the worse health outcomes, which may partially explain the contrast with our finding. Nevertheless, the study highlights that racial-based health inequities persist and need further attention.

Similarly, a 2022 study by Landes *et al.* showed that the racial and ethnic-based inequities in age at death exist in IDD individuals, especially highlighting the fact that Black and Latino individuals with IDD die significantly earlier as compared to White and other racial group individuals [21]. While the study focused on all-cause mortality and did not delve into CVD or any other specific cause, it still shows that racial disparities exist in the IDD population.

To further explain these differences, there is a need to examine variations in healthcare access and utilisation. Scott and Havercamp reported that racial and ethnic minorities with IDD, most notably Latinos/Hispanics, were less likely to receive essential healthcare services than White individuals with IDD [22]. Such obstacles in chronic disease care, early detection, and routine care might explain the differential mortality trends noted in our study.

In addition, differences in chronic disease burden could also account for the variation we noted. A recent nationwide study by Zandam *et al.* examined multiple chronic conditions (MCC) related to emergency department visits, hospital stays, and mortality in adults with IDD, by race/ethnicity. They found that Black and Latino individuals with IDD had considerably greater risks of negative outcomes, including mortality, relative to White peers [23]. Although the study did not separate mortality by condition, it counted ischaemic heart disease as a principal cause of cardiovascular mortality within its MCC framework. These results validate our observation that structural disparities play a part in the health outcomes of racially minoritised persons with IDD and imply that some mortality is underreported or underdiagnosed among minority groups because of delayed diagnosis or reduced use of health services.

Our results contribute to this discussion by illustrating that non-Hispanic Whites with IDD may have the greatest rate of mortality even within a particular cause of death, e.g. CVD. Differences in baseline disease burdens, living in institutions, over-documentation in healthcare records, or higher cause-specific documentation of mortality may all be contributing factors. However, previous research shows that Black and Hispanic individuals with IDD often experience underdiagnosis, poor access to care, and increased rates of chronic illness, which can cause their mortality risk to be underestimated.

Our study also revealed that the highest concentration of mortality due to CVD was seen in older individuals, especially those aged 55–64 years and 65–74 years, followed closely by the 75–84 age group. Similarly, a 2018 Ontario-based study focused on individuals with IDD aged 25–99 years, broadly classifying age as 25–44, 45–64, and 65+ years. The study found that the 65 and above age group had higher mortality rates, and CVD was a prominent cause of death, although further age stratification within older age groups was not mentioned [24].

Moreover, a study comparing mortality from certain US state disability service systems and Medicaid claims reported that people with IDD had an average age at death ranging from 50 to 63 years based on the data source. Crude mortality was 15.2 per thousand, with obvious increases in the risk of mortality as age progressed, highlighting the vulnerability of older people with IDD [25]. The results of existing research are concordant with our study, emphasising higher exposure of older people to death; this reinforces the necessity for additional focused interventions and better access to healthcare for this vulnerable group.

In our analysis, the CVD mortality rate among those with IDD was greatest in metropolitan areas and the Southern census region, indicating that there may be significant geographic variation. However, few studies have directly examined these patterns. Fortney and Tassé (2021) reported that those with IDD living in rural communities were more likely to experience limited access to health care and support, resulting in poorer health outcomes over time. Their evidence backs the notion that geography drives the quality of treatment [26], although the study did not focus on CVD. Meanwhile, Nair *et al.* (2022) reviewed national-level data between 1990 and 2019, and found substantial regional disparities in IDD prevalence, particularly in countries with lower socio-demographic index (SDI) levels [27]. This underlines that structural and social risks are spatially sensitive and can cause unequal disease burdens. However, there has been no study associating urbanisation or census region with CVD mortality in IDD, suggesting an important void. Our results provide initial evidence and indicate the necessity of future geographically targeted research among this population.

Finally, a 22-year CDC-WONDER study from Suresh *et al.* (2023) reported that a substantial number of people with intellectual disabilities had died in hospital, thus suggesting inequalities in place of death [28].

The study, while thorough, has limitations that should be noted. To begin, the reliance on death certificate data in CDC WONDER could result in underreporting or misclassification of IDD or CVD as the cause of death for those with less severe IDD. This could bias mortality estimates. Second, our estimates do not control for factors at the individual level, including comorbidities, income, living situation, or severity of disability that can affect risk and care access. That granularity is limited by the data, which hinders causal pathways and healthcare use differences exploration. Third, international comparisons are constrained by differences in surveillance systems, diagnostic criteria, and reporting conventions. These differences may partly account for variations in global findings and constrain generalisability. Lastly, racial and geographic disparities in mortality should be interpreted with consideration. Elevated rates among non-Hispanic Whites in our data may be a function of better documentation and not reflect actual differences, while underdiagnosis of minorities could conceal actual risk.

In conclusion, throughout more than 25 years, our review demonstrates a continued reduction in CVD death among those with IDD in the US, and the implication is improvement in preventive treatment and access to healthcare. However, disparities exist by gender, race, geography, and age. Males, elderly individuals, non-Hispanic Whites, and inhabitants of metropolitan and Southern regions continue to maintain higher rates of mortality.

International literature provides variable patterns, influenced by heterogeneity in health systems, models of care, and surveillance. Except for these differences, however, there is a single message: those with IDD have a high risk of premature CVD death. Targeted public health interventions, equitable models of care, and further exploration of neglected populations are required to enhance long-term outcomes.

Funding

No external funding.

Ethical approval

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

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