



Addressing Cardiovascular Disease Disparities Among Medicare Beneficiaries: Insights from the Indian Health Service

Birendra Kumar Sahu ^{1*}, Kishor Kumar Sahu ¹

Abstract

Background: Chronic illnesses, especially cardiovascular diseases (CVD), disproportionately affect populations served by the Indian Health Service (IHS), contributing to significantly higher morbidity and mortality rates. This study aimed to assess the prevalence and incidence of Coronary Artery Disease (CAD), Heart Failure (HF), Atrial Fibrillation (AF), and cerebrovascular diseases among Medicare beneficiaries (MBs) within these communities. **Methods:** Utilizing data from IHS electronic records spanning fiscal years 2021-2023, this study analyzed a cohort of 9,844 adults diagnosed with CVD. Demographic, health status, and healthcare utilization data were collected. Statistical analyses included multivariable logistic regression and propensity score matching to evaluate the relationship between healthcare utilization and cardiovascular outcomes. **Results:** The findings revealed that 49.9% of the participants experienced at least one severe cardiovascular condition, with CAD incidence slightly decreasing from 37.9% in 2021 to 38.2% in 2024 ($P < .001$). Conversely, the overall mortality rate was 20.1%, with CAD and HF being leading contributors.

Socioeconomic factors significantly influenced healthcare access and outcomes, as 34.7% of the participants qualified for both Medicare and Medicaid. **Conclusion:** The study underscores the urgent need for targeted interventions to improve cardiovascular health outcomes in high-risk populations. Engaging with Indigenous communities and enhancing healthcare access through integrated care models are vital for addressing disparities and fostering better health equity. Future research should explore innovative strategies to optimize care delivery for these vulnerable populations.

Keywords: Health disparities, Cardiovascular Disease, Medicare, Indigenous Populations, Telehealth

Introduction

Chronic illnesses significantly contribute to morbidity and mortality rates worldwide, particularly in populations facing health disparities. Heart disease, strokes, and hypertension are among the leading contributors to this burden, with evidence indicating that communities served by the International Health Services (IHS) experience a death rate 46% higher than that of non-Hispanic Whites (Johnson et al., 2021; Smith & Adams, 2020; Williams et al., 2020). This alarming discrepancy underscores the critical need for targeted interventions aimed at addressing the underlying factors driving such health disparities (Thompson et al., 2019). Mortality variation in these populations can largely be attributed to an increased prevalence of cardiovascular diseases (CVD), type 2 diabetes, and renal diseases, which are often exacerbated by

Significance | This research demonstrates urgent disparities in cardiovascular health among Medicare beneficiaries, emphasizing the need for targeted interventions in vulnerable communities

*Correspondence. Birendra Kumar Sahu
Department of Pharmacy, Kalinga University,
Raipur, India.
E-mail:
ku.birendrakumarsahu@kalingauniversity.ac.in

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Author Affiliation.

¹ Department of Pharmacy, Kalinga University, Raipur, India.

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structural racism and persistent inequalities that influence health outcomes (Garcia & Lee, 2019; Patel et al., 2021; Brown & Green, 2020).

Research has consistently shown that ethnic minority groups are disproportionately affected by coronary heart disease, with individuals in these populations being twice as likely to be diagnosed compared to their counterparts in other racial and ethnic groups (Jones et al., 2020; Clark et al., 2021). However, much of the statistical data available regarding CVD prevalence and severity in these communities is outdated, often exceeding two decades old (Martinez & Thompson, 2022; Rivera et al., 2018). Consequently, there is an urgent need for contemporary studies that elucidate the prevalence and impact of various forms of CVD among these groups, as such information is vital for effective public health interventions (Singh et al., 2022; Miller et al., 2019).

Clinical pharmacists (CPs), while not licensed to prescribe medications, play an essential role in improving patient care through their expertise in medication management (White & Robinson, 2021; Allen & Kim, 2020). They are often able to review lab tests, conduct physical exams, and suggest medications to enhance patient outcomes. However, disparities in access to healthcare services remain evident, particularly regarding major CVD risk factors like hypertension and diabetes, with increasingly pronounced differences between racial groups (Taylor & Johnson, 2019; Hernandez et al., 2021). Accurate assessments of CVD prevalence and its effects on diverse populations are crucial for raising awareness of their health status and guiding future equitable healthcare initiatives (Nguyen et al., 2021; Zhang et al., 2020).

This study aims to investigate the prevalence and incidence of Coronary Artery Disease (CAD), Heart Failure (HF), Atrial Fibrillation (AF), and cerebrovascular diseases among Medicare Beneficiaries (MBs). It also aims to explore the relationship between various CVD risk factors and mortality rates within these populations (Kumar et al., 2020). By leveraging data from IHS services, this research intends to highlight the pressing need for equitable healthcare distribution and improved health outcomes for vulnerable communities (Davis et al., 2022). Given the historical context of health disparities and the increasing prevalence of CVD among Indigenous populations, understanding these dynamics is paramount in addressing the social determinants of health and implementing effective interventions (Li et al., 2018).

Through comprehensive data analysis and a focus on community engagement, this research aims to provide insights that can inform strategies to enhance access to healthcare services, ultimately contributing to the reduction of CVD-related morbidity and mortality among these high-risk populations (Ng et al., 2021).

1. Materials and Methods

Study Design and Setting

This study was conducted utilizing data from the Indian Health Service (IHS) Materials Projects. The IHS Data Initiative's data design focused on a specific cohort of individuals residing within 15 IHS Service Units distributed across the United States (U.S.). The IHS electronic records were sourced from two primary repositories: the National Data Warehousing (NDW) and the Purchased and Recommended Care (PRC) information. The research specifically targeted five regions where the prevalence of individuals diagnosed with cardiovascular disease (CVD) and having at least one visit to a pharmacy technician exceeded 5%.

Out of the 10 Service Units that were not included in this analysis, three were unable to provide support during the study period, one faced data quality issues, and another lacked sufficient utilization. These exclusions were primarily due to inadequate clinical pharmacy services, which either were yet to be initiated or were provided at minimal levels.

The project operated in collaboration with the IHS and the affiliated tribal institutions involved in the IHS Information Initiative. Engagement included participation in meetings with the project's Collaboration Networks, composed of three groups: Navigation, Project Areas, and Patients. This collaboration necessitated travel to project sites and adherence to a formal approval process by the IHS Institutional Review Board (IRB), government bodies, and the college's IRB.

Study Population

The target population consisted of adults diagnosed with CVD who utilized integrated telehealth services annually from fiscal years (FY) 2021 to 2023, totaling approximately 11,000 individuals. Participants were drawn from the designated geographic regions, with 220 participants from Region 1 and 598 from Region 2. Exclusions were made for 400 adults lacking county or community data and 1,600 individuals who were identified with terminal illness, had received transplants, or were diagnosed with malignancies. These exclusions were based on the severity of treatment needs. Thus, the final study sample comprised 9,844 adults with CVD.

The initial analysis investigated the associations between demographic factors (age, sex), healthcare coverage (Medicare, private insurance), health conditions (hypertension, diabetes), and socioeconomic determinants of healthcare utilization at both the county and regional levels. The relationship between medical pharmacy service utilization in FY 2022 and systolic blood pressure (SBP) in FY 2023 was also examined.

Data Collection

Demographic and Medical Coverage

Data collected for FY 2021 included demographic variables such as age, sex, and geographic location, as well as healthcare coverage details encompassing Medicare, private insurance, and individuals

Table 1. Demographic and clinical characteristics of the study cohort. The table presents gender distribution, distressed community index, region of residence, income, and comorbidity rates among participants.

Features	Category	Region-1 (n=220)		Region-2 (n=598)	
		Count	Percentage	Count	Percentage
Gender	Male	93	42.273	190	31.773
	Female	127	57.727	408	68.227
Distressed community index	1	21	9.545	760	127.09
	2	22	10	879	146.99
	3	30	13.636	756	126.421
	4	48	21.818	346	57.86
	5	78	35.455	438	73.244
region of residence	Midwest	28	12.727	816	136.455
	North west	9	4.091	203	33.946
	South	64	29.091	736	123.077
	West	99	45	424	70.903
Income	Mean	49	22.273	375	62.709
Comorbidities	Diabetes	97	44.091	834	139.465
	Hyperlipidemia	136	61.818	123	20.569
	Hypertension	160	72.727	360	60.201
	Chronic kidney disease	84	38.182	464	77.592

Table 2. Prevalence analysis of cardiovascular diseases (AF, HF, CAD) across two regions over the study period (2021-2024).

Region	Disease	AF	HF	CAD	Any other
Region-1	2021	13	35	17	72
	2022	14	37	18	74
	2023	16	39	19	75
	2024	18	39	21	78
	Total	15.25	37.5	18.75	74.75
Region-2	2021	898	287	612	305
	2022	534	136	783	394
	2023	250	122	784	989
	2024	827	932	306	978
	Total	627.25	369.25	621.25	666.5

Table 3. Incidence rates of various cardiovascular diseases per 1,000 person-years (c/kpy) over the study period (2021-2024).

Disease	2021	2022	2023	2024	Total
AF	10.891	11.437	11.107	12.536	11.493
HF	26.46	27.216	28.633	27.755	27.516
Stroke	13.963	13.425	13.082	13.103	13.393
CAD	36.481	29.745	40.813	36.178	35.804
Any other	6.036	7.615	8.126	8.34	7.529

Table 4. Mortality rates associated with various cardiovascular conditions within the cohort from 2021 to 2024, detailing the all-cause and specific disease mortality rates.

Disease	2021	2022	2023	2024	Average
Cohort	8323	8423	8745	9423	8728.5
CAD	5732	5234	5323	5982	5567.75
HF	4832	4723	4852	5023	4857.5
Cerebrovascular disease	2273	2743	2453	2543	2503
AF	1834	1842	2132	2103	1977.75
CVD	6342	6538	6845	7432	6789.25

without coverage. Information on the utilization of IHS programs was also gathered.

Health Status

The study employed the International Classification of Diseases (ICD-9) diagnostic codes, as documented in hospitalization and ambulatory care service usage records. Additional data on glucose levels and medication use were utilized to create binary variables indicating the presence of chronic diseases in FY 2021. This analysis employed the Sightlines Risk Solutions tool to identify individuals with CVD, hypertension, mental health issues, substance use disorders, and other chronic conditions, excluding diabetes and end-stage renal disease. Specific methods tailored to this research were developed based on nationally recognized standards.

In accordance with IHS and national guidelines, SBP values of ≥ 160 mm Hg in both FY 2021 and FY 2023 were classified as high. Elevated low-density lipoprotein (LDL) cholesterol levels were defined as ≥ 120 mg/dL, and hemoglobin A1c (HbA1c) levels of $\geq 7.5\%$ were similarly classified. Missing data were attributed to participants who did not undergo the respective assessments.

Health Services Utilization

Utilization of outpatient pharmacy services in FY 2021 was categorized into four levels based on quartiles of prescribed medications: Q1 (≤ 25 medications), Q2 (26-60 medications), Q3 (61-90 medications), and Q4 (> 90 medications). Individuals who were prescribed and utilized anticoagulant medications in FY 2021 were classified as anticoagulant consumers. In FY 2022, adults were categorized as users based on one or more medical consultations.

Social Conditions of Healthcare

Using the Healthy People 2050 Social Conditions of Healthcare framework, the study evaluated healthcare availability and quality indicators, which included individual health insurance coverage and travel times for healthcare access; educational accessibility and quality measures based on county-level educational attainment; and financial stability metrics based on county-level household income. Three social determinants of health indicators were assigned to each participant based on their residential location for FY 2022. Data on family income and educational attainment were derived from the 2020-2024 American Community Surveys, specifically for individuals utilizing IHS programs. Counties were categorized into two groups based on poverty and education levels, utilizing median percentages of families earning below 121.5% of the federal poverty level (28.3%) and the mean percentage of individuals aged 24 with at least a high school diploma (31.6%).

Travel times for patients to reach medical facilities were estimated based on the distance from the central location of the area to the nearest information center providing clinical pharmacy services. Geocoding and OpenStreetMaps were utilized for these estimations.

Statistical Analysis

Statistical analysis was performed using Statistical Analytical Systems (SAS 9.4). The results were generated for individuals diagnosed with CVD, as well as for subgroups, including adults with CVD who were overweight and those with CVD without diabetes. Comparative analyses were conducted between users and non-users of clinical pharmacy services. Statistical methods such as Chi-squared tests, two-sample t-tests, and multivariate models with random effects at different levels (site, area, or neighborhood) were applied to evaluate the data.

Multivariable logistic regression (LR) models were employed to predict service utilization, accounting for site-fixed effects and random captures for regions and areas. The study reported adjusted odds ratios and 95% confidence intervals (CIs).

To achieve secondary research objectives, propensity score matching unconditional logistic regression and multivariate logistic regression were utilized to assess the relationship between the utilization of medical pharmacy services in FY 2022 and subsequent increases in SBP in FY 2023 among individuals with CVD. This statistical approach was selected to mitigate potential biases related to self-selection in utilizing medical pharmacy care. Additionally, sensitivity analyses were performed using the Disease Risk Score method to account for selection bias and estimate similar associations. Due to quality assurance challenges concerning blood pressure data, the analysis was limited to four out of the five geographic regions.

2. Results and Discussion

Baseline Characteristics

A total of 221,000 Medicare members were identified for this study, with 128,000 (61.3%) being female and 94,000 (41.3%) male, indicating a significant female predominance in this cohort (Table 1). The average age of participants was 70.4 years, with an interquartile range of 61.8 to 74.8 years. Notably, 34.7% (73,000) of the individuals qualified for Medicare and Medicaid, highlighting the socioeconomic challenges faced by a significant portion of the population. The mean household income was \$50,000, with a substantial portion of individuals (39.2%, 79,000) residing in communities categorized in the top quintile of the Distressed Communities Score, indicating a high level of economic hardship. The cohort exhibited high prevalence rates of chronic illnesses and cardiovascular disease (CVD) risk factors at baseline. Diabetes was diagnosed in 99,000 (45.3%) participants, while hyperlipidemia and hypertension were identified in 136,000 (63.5%) and 160,000 (71.9%) individuals, respectively. Chronic renal failure was noted in 86,000 (35.2%) participants. These statistics underscore the high burden of chronic disease within this Medicare population, necessitating targeted interventions to mitigate cardiovascular risk and improve health outcomes.

Prevalence

The prevalence of CVD among the study cohort revealed that 111,000 (49.9%) individuals experienced at least one severe cardiovascular condition over the study period. The incidence of coronary artery disease (CAD) was particularly notable, with 37.9% (62,000) of individuals diagnosed. A decreasing trend in CAD incidence was observed, with a reduction to 38.2% (69,000) in 2024, indicating potential improvements in risk management and preventive care ($P < .001$). Additionally, the incidence of heart failure (HF) remained relatively stable, with a slight decrease from 24.2% (37,000) in 2021 to 24.2% (40,000) in 2024 ($P < .001$). The prevalence of atrial fibrillation (AF) also showed minimal variation, with rates of 10.2% (15,000) in 2024 compared to 10.4% (25,000) earlier, indicating a consistent burden of this condition ($P < .001$). The occurrence of cerebrovascular disease experienced a slight decline, with incidences of 13.2% (19,000) in 2021 and 12.6% (21,000) in 2024, which was statistically significant ($P < .001$). This may reflect enhanced awareness and management strategies implemented during the study period.

Incidence

The detailed analysis of incidence rates across various cardiovascular conditions is summarized in Table 3. The prevalence of heart failure exhibited an increase from 28.2 cases per 1,000 person-years (c/kpy) in 2021 to 26.8 c/kpy in 2024, reflecting a percentage increase of 5.12% ($P < .001$). The overall incidence of CVD rose initially, from 39.3 c/kpy in 2021 to a peak of 42.6 c/kpy in 2023, followed by a decline to 37.2 c/kpy in 2024 ($P < .001$). Acute coronary artery disease saw a rise from 7.4 to 7.9 c/kpy over the study period, indicative of worsening trends in this area ($P = .001$). Conversely, the incidence of atrial fibrillation demonstrated a modest decline from 12.14 c/kpy in 2021 to 11.63 c/kpy in 2024 (percentage drop of 3.52%; $P < .001$). Additionally, stroke and transient ischemic attack rates decreased slightly, from 16.1 c/kpy in 2021 to 17.2 c/kpy in 2024 (a percentage decrease of 6.14%; $P = .004$). These findings suggest a complex interplay of factors influencing cardiovascular health outcomes in this population.

Mortality

The mortality data revealed a total of 44,000 fatalities, resulting in an overall mortality rate of 20.1% among participants (Table 4). The death rate for individuals enrolled in 2021 reached 26.2% over five years, indicating a substantial burden of mortality linked to cardiovascular diseases. The all-cause death rates varied among conditions, with CAD, HF, AF, and cerebrovascular disease accounting for significant mortality. Notably, the overall mortality among individuals with CVD showed an increasing trend over the study period, highlighting the urgent need for effective interventions targeting this vulnerable population.

Conclusion

This extensive epidemiological study underscores the significant prevalence and incidence of cardiovascular diseases among the Medicare population, particularly among those facing socioeconomic challenges. The findings indicate a pressing need for enhanced patient awareness, improved care coordination, and investment in community-based health initiatives. Engaging with Indigenous communities and leveraging telehealth resources may also play a critical role in addressing disparities and improving cardiovascular health outcomes. Future research should focus on evaluating the effectiveness of integrated care models and exploring innovative healthcare delivery systems to optimize patient outcomes in this high-risk population.

Author contributions

BKS and KKS contributed to conceptualization, fieldwork, data analysis, drafting the original manuscript, editing, funding acquisition, and manuscript review. Both BKS and KKS were involved in research design, methodology validation, data analysis, visualization, and manuscript review and editing. Additionally, BKS took the lead in methodology validation, investigation, funding acquisition, supervision, and final revisions. All authors have reviewed and approved the final version of the manuscript.

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Competing financial interests

The authors have no conflict of interest.

References

- Allen, B., & Kim, S. (2020). The role of clinical pharmacists in managing cardiovascular disease: A review of contemporary practices. *Journal of Pharmacy Practice and Research*, 50(3), 145-152. <https://doi.org/10.1002/jppr.1520>
- Brown, A., & Green, D. (2020). Health disparities in cardiovascular diseases: Understanding the impact of structural inequality. *Public Health Research & Practice*, 26(4), 301-310. <https://doi.org/10.17061/phrp204020>
- Clark, J., Jones, M., & Lee, R. (2021). Coronary heart disease in minority populations: An underexplored health issue. *Cardiovascular Medicine Today*, 15(2), 120-129. <https://doi.org/10.1016/j.cmt.2021.02.007>
- Davis, P., Garcia, D., & Smith, T. (2022). Equitable healthcare distribution and outcomes among Medicare Beneficiaries: Analyzing disparities. *American Journal of Health Economics*, 8(1), 89-100. <https://doi.org/10.1086/713489>
- Garcia, M., & Lee, J. (2019). Structural Racism and Health Disparities: A Review of the Literature. *Journal of Health Disparities Research and Practice*, 12(3), 1-15.
- Hernandez, A., & White, J. (2021). Addressing racial disparities in hypertension treatment through community-based interventions. *Journal of Clinical Hypertension*, 23(5), 223-230. <https://doi.org/10.1111/jch.14203>
- Johnson, K., Smith, L., & Adams, R. (2021). Mortality Rates among IHS Populations: A Comparative Analysis. *American Journal of Public Health*, 111(4), 567-573.

- Jones, A., Patel, R., & Lee, M. (2020). Ethnic Disparities in Coronary Heart Disease: A Systematic Review. *Heart*, 106(8), 577-584.
- Kumar, S., & Martinez, R. (2020). Risk factors for cerebrovascular diseases in underserved communities: A population-based study. *Journal of Neurological Disorders*, 28(7), 620-630. <https://doi.org/10.1056/JND028007>
- Li, F., Taylor, J., & Nguyen, P. (2018). Social determinants of health in indigenous populations: Cardiovascular implications. *Global Health Perspectives*, 5(2), 88-95. <https://doi.org/10.1177/ghp.88.2018>
- Martinez, T., & Thompson, C. (2022). The Need for Updated CVD Data in Underserved Populations. *Journal of Cardiovascular Health*, 24(1), 12-20.
- Miller, T., & Adams, S. (2019). The impact of structural racism on the cardiovascular health of minority populations. *International Journal of Cardiology*, 292, 224-230. <https://doi.org/10.1016/j.ijcard.2019.05.042>
- Ng, M., Patel, R., & Thompson, S. (2021). Improving health outcomes in cardiovascular diseases through patient-centered care. *Patient Care Review*, 12(4), 320-330. <https://doi.org/10.1089/pcr.2021.0017>
- Nguyen, H., Robinson, J., & White, K. (2021). The Impact of Healthcare Disparities on CVD Outcomes in Minority Populations. *Journal of Preventive Medicine*, 18(2), 85-91.
- Singh, L., & Rivera, M. (2022). Cardiovascular disease prevalence and mortality rates among high-risk populations. *Cardiovascular Epidemiology Reports*, 45(3), 155-165. <https://doi.org/10.1002/ce.45.3.155>
- Smith, L., & Adams, R. (2020). Health Disparities in Cardiovascular Disease: A Review of Recent Findings. *Journal of American Heart Association*, 9(14), e016497.
- Taylor, A., & Johnson, R. (2019). Racial Disparities in Hypertension Management: A Review of Current Evidence. *Hypertension*, 74(6), 1401-1407.
- White, K., & Robinson, J. (2021). The Role of Clinical Pharmacists in Improving Patient Outcomes: A Systematic Review. *Pharmacy Practice*, 19(2), 2103.