














ORIGINAL ARTICLE



Where Adults With Heart Failure Die: Insights From the CDC-WONDER Database

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BACKGROUND: Heart failure (HF) is associated with high mortality rates and substantial health care costs. While there is growing emphasis on integrating palliative care for patients with HF, limited data exist on the locations where adults with HF spend their final days. The study aimed to analyze the location and circumstances of death among adults with HF in the United States using Centers for Disease Control and Prevention's Wide-ranging Online Data for epidemiological Research data.

METHODS: Mortality data from individuals aged ≥ 20 years, with HF listed as the cause of death between 1999 and 2023, were analyzed. The places of death were categorized as the emergency room, hospice/nursing home, inpatient medical facility, or home. Multinomial logistic regression was performed to examine the associations between demographic factors and death location.

RESULTS: HF-related mortality rates declined from 1999 (3.60% and 143.6 age-adjusted mortality rate) to 2010 (3.47% and 123.1 age-adjusted mortality rate). However, rates gradually increased thereafter, reaching 5.18% and 168.1 age-adjusted mortality rate in 2023. Deaths at home nearly doubled, rising from 18.41% (50 648 of 275 132) in 1999 to 33.47% (132 470 of 395 826) in 2023. Hospice/nursing home deaths increased from 30.95% (85 144 of 275 132) in 1999 to 34.71% (116 634 of 336 014) in 2017, but declined to 29.54% (116 931 of 395 826) by 2023. Young adults (20–34 years) had the highest proportion of inpatient deaths. Sex, ethnicity, and urbanization were significant predictors of death location, with men, White individuals, and those in large metropolitan areas more likely to die in medical facilities.

CONCLUSIONS: This study underscores the shifting trends in the locations of death among patients with HF, with a ≈ 2 -fold increase in HF-related deaths occurring at home over the past 2 decades. The recent decline in hospice/nursing home deaths, following a period of steady growth, calls for an in-depth examination of contributing barriers. Further research is essential to understand the sociodemographic factors driving disparities in HF-related death locations.

Key Words: cause of death ■ heart failure ■ hospices ■ inpatients ■ urbanization

Heat failure (HF), due to its overwhelming global prevalence, was first recognized as an epidemic by Braunwald et al¹ in 1997. Since then, advances in disease management and an aging global population have driven a massive surge in HF prevalence. Conservative estimates approximate that HF affects 64.3 million people worldwide.² However, the situation is particularly dire in the United States, where 1 in 4 people is expected to develop HF during their lifetime.³ This pervasive prevalence is

compounded by the syndrome's starkly high mortality rates. Studies estimate a 5-year survival rate as low as 50%, a statistic that surpasses the mortality of many cancers.^{4–6} In this context, effective HF management has become a central focus in cardiovascular disease care, with palliative care gaining prominence as an integral component of comprehensive treatment strategies. Palliative care has been associated with significant reductions in symptom burden and acute health care utilization which has

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WHAT IS NEW?

- This study is the first to offer a comprehensive, nationally representative analysis of heart failure-related mortality stratified by place of death over a 25-year period in the United States.
- It reveals a ≈2-fold increase in deaths occurring at home and a decline in inpatient and hospice/nursing home deaths in recent years.
- The study also uncovers striking age, sex, race, and geographic disparities in end-of-life care settings for heart failure patients.

WHAT ARE THE CLINICAL IMPLICATIONS?

- The evolving trends in place of death suggest a growing need for robust, community-based palliative care infrastructure, especially for underserved groups.
- Clinicians should recognize and address sociodemographic barriers that impact where patients with heart failure spend their final days.
- These findings can help inform more patient-centered and equitable end-of-life care planning, as well as support resource allocation for home and hospice care services.

Nonstandard Abbreviations and Acronyms

HF	heart failure
OR	odds ratio

positioned it favorably, especially when HF-related medical costs are projected to reach \$69.8 billion by 2030.⁷ This growing recognition has prompted efforts to enhance the quality and accessibility of home and hospice-based health care interventions, reflected in their inclusion in clinical practice guidelines.⁸

Building on this context, analyzing HF mortality by place of death is particularly relevant for assessing the impact of incorporating end-of-life and home/hospice care into HF management strategies. Such an analysis can provide valuable insights into the adoption of these approaches, their effectiveness in reducing disease burden, and the identification of gaps in comprehensive health care delivery for managing HF.

METHODS

Data Sources and Extraction

Data on mortality and causes of death were obtained from publicly accessible records provided by the National Center for Health Statistics. For this study, we leveraged aggregated data from the Centers for Disease Control and Prevention's Wide-ranging Online Data for Epidemiological Research database, spanning the period between 1999 and 2023. We included

all deaths among individuals aged 20 years or older where HF was documented as a cause of death. Multiple cause-of-death records were utilized to identify cases of HF, which were defined by the *International Classification of Diseases, Tenth Revision* code I50.x. The underlying cause of death was based on the certifying physician's report on the death certificate, representing the primary disease or injury that initiated the chain of events leading directly to death.

To ensure the integrity of our dataset, we excluded deaths attributed to suicide, accidents, homicide, self-inflicted injuries, ongoing investigations, or unknown causes. These exclusions were made to avoid confounding factors that could skew the analysis of natural HF-related deaths. Given that the data were de-identified and publicly available, the study was exempt from informed consent requirements, as per US Department of Health and Human Services regulation 45 CFR 46.101(c). Institutional review was waived on the same grounds.

Variables

The primary outcome of interest was the location of death, categorized into 4 settings: inpatient medical facility, the decedent's residence, hospice facility or nursing home, and outpatient medical facility or emergency room. These categories were selected to capture the varying settings of end-of-life care, which may reflect differences in access to health care and personal or family preferences.

Independent variables included age, sex, race, Hispanic origin, and urbanization level, all of which are well-documented sociodemographic factors that influence health outcomes, health care access, and end-of-life care decisions. Age was grouped into 4 categories: 20 to 34, 35 to 49, 50 to 64, and >65 years. Sex was classified as male or female. Race was divided into White, Black, American Indian, and Asian or Pacific Islander, while Hispanic origin was designated as Hispanic or non-Hispanic. The urbanization level of the decedent's county was classified according to the National Center for Health Statistics Urban-Rural Classification Scheme for Counties, with categories ranging from large metropolitan areas (population ≥1 million) to nonmetropolitan or rural areas (population <50 000). These variables were chosen to allow for the adjustment of differences in health care availability, disease burden, and cultural variations, which may impact end-of-life care.

Statistical Analysis

We used multinomial logistic regression to examine the relationship between the place of death and sociodemographic factors. The place of death served as the dependent variable with 4 categories: inpatient medical facility (reference category), decedent's residence, hospice facility or nursing home, and outpatient medical facility or emergency room. The independent variables included age, sex, race, Hispanic origin, and urbanization level. Age-adjusted mortality rates were standardized to the 2000 US population. Temporal trends in age-adjusted mortality rates were modeled and evaluated using the Joinpoint Regression Program (Version 5.2.0, National Cancer Institute). Log-linear regression models quantified national annual trends, with results presented as the annual percent change and corresponding 95% CIs. The annual percent change, expressed as a percentage, represents the average annual rate of change in age-adjusted mortality rate, facilitating clear interpretation of temporal patterns. The

Weighted Bayesian Information Criterion was used to determine the optimal number of joinpoints, identifying significant trend changes while balancing model complexity and fit.

Multicollinearity among the independent variables was assessed using the variance inflation factor, with all values being <2, indicating acceptable levels of multicollinearity. The independence of irrelevant alternatives assumption inherent in multinomial logistic regression models was considered appropriate for this study. This assumption holds because the categories of the dependent variable are mutually exclusive and independent; the relative odds of choosing 1 place of death over another are unaffected by the inclusion or exclusion of other categories. As a secondary check, we performed the Hausman-McFadden test to validate the independence of irrelevant alternative assumption. The test results did not reveal any violation of the independence of irrelevant alternative assumption, confirming the suitability of the multinomial logistic regression model for our analysis.

Odds ratios (ORs) and 95% CIs were calculated to quantify associations between sociodemographic factors and the place of death. A 2-sided *P* value of <0.05 was considered statistically significant. All statistical analyses were conducted using the R Statistical Language (Version 4.4.1; R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Yearly Trends

Between 1999 and 2023, a total of 7 644 759 deaths were attributed to HF. Among the decedents, 53.4% were

women, 87.9% were White, and 90.3% were adults aged >65 years. Table 1 provides a summary of the aggregated data for the place of death based on HF decedent characteristics. Over the duration of the study period, there was a significant increase in HF-related deaths. Yearly trend analysis revealed that HF-related mortality decreased from 1999 to 2012 (annual percent change, -2.2 [95% CI, -2.6 to -1.9]), with a sudden reversal from 2012 onwards (annual percent change, 2.5 [95% CI, 2 to 3.2]; Figure 1A). There was also a decrease in the proportion of HF deaths occurring in medical facilities, from 45.1% (124 171–275 132) in 1999 to 32.4% (128 412–395 826) in 2023. The proportion of HF deaths in emergency rooms has remained approximately the same over this period, from 5.5% (15 168–275 132) in 1999 to 4.6% (18 013–395 826) in 2023. However, a significant increase in the proportion of deaths at home, rising from 18.4% (50 648–275 132) in 1999 to 33.5% (132 470–395 826) in 2023, has been recorded. Throughout the study period, the percentage of fatalities in hospice/nursing institutions increased from 30.9% (85 144–275 132) in 1999 to 34.7% in 2017 (116 634–336 014), before diminishing from 34.1% (119 224–350 013) in 2018 to 29.5% (116 931–395 826) in 2023. The yearly trends in places of death attributable to HF are plotted in (Figure 1B). Younger age groups recorded higher numbers of death at medical

Table 1. Aggregated Data for Adults for Places of Death by Decedent Characteristics for Heart Failure (1999–2023)

Decedent characteristics	Total, n (%)	Medical facility inpatient (%)	Medical facility-outpatient or ER (%)	Decedent home (%)	Hospice or nursing facility (%)
No. of deaths	7 644 759 (100%)	2 731 582 (35.7%)	379 317 (4.96%)	2 078 986 (27.2%)	2 454 874 (32.1%)
Age, y					
20–34	20 704 (0.27%)	11 647 (56.2%)	3369 (16.2%)	4892 (23.6%)	796 (3.84%)
35–49	110 382 (1.44%)	54 541 (49.4%)	17 168 (15.5%)	32 007 (29%)	6666 (6.03%)
50–64	600 568 (7.85%)	281 488 (46.8%)	66 636 (11%)	182 891 (30.4%)	69 553 (11.6%)
65+	6 913 105 (90.4%)	2 383 906 (34.9%)	292 144 (4.22%)	1 859 196 (26.8%)	2 377 859 (34.4%)
Sex					
Female	4 088 199 (53.4%)	1 366 621 (33.4%)	172 323 (4.22%)	1 021 977 (25%)	1 527 278 (37.4%)
Male	3 556 560 (46.6%)	1 364 961 (38.4%)	206 994 (5.82%)	1 057 009 (29.7%)	927 596 (26.1%)
Race					
White	6 727 596 (87.9%)	2 326 064 (34.6%)	292 735 (4.35%)	1 836 567 (27.3%)	2 272 230 (33.8%)
Black	749 720 (9.81%)	331 634 (44.2%)	74 704 (9.97%)	190 945 (25.4%)	152 437 (20.4%)
American Indian	37 059 (0.48%)	15 527 (41.9%)	2713 (7.31%)	11 625 (31.4%)	7194 (19.4%)
Asian or Pacific Islander	130 384 (1.71%)	58 357 (44.7%)	9165 (7.02%)	39 849 (30.5%)	23 013 (17.7%)
Hispanic origin					
Hispanic	358 353 (4.68%)	156 984 (43.8%)	23 012 (6.4%)	113 253 (31.6%)	65 104 (18.2%)
Non-Hispanic	7 286 406 (95.3%)	2 582 839 (35.4%)	355 404 (4.9%)	1 962 784 (26.9%)	2 385 379 (32.8%)
Urbanization					
Large metro	3 493 124 (45.6%)	1 322 797 (37.9%)	175 461 (5.03%)	939 609 (26.9%)	1 055 257 (30.2%)
Medium/small metro	2 516 252 (32.9%)	851 188 (33.8%)	118 926 (4.72%)	700 517 (27.8%)	845 621 (33.6%)
Rural	1 635 383 (21.3%)	557 597 (34.1%)	84 930 (5.19%)	438 860 (26.8%)	553 996 (33.9%)

ER indicates emergency room; and metro, metropolitan area.

facilities, in contrast to their older counterparts in the >50 years of age subset, where the largest percentage of deaths occurred in hospice/nursing homes (Figure 2).

Multinomial Regression Findings

Multivariable logistic regression analysis identified significant associations between decedent characteristics and the place of death, using inpatient deaths as the reference category (Table 2). Compared with individuals aged >65 years, young adults (20–34 years) were less likely to die at home (OR, 0.56 [95% CI, 0.54–0.58]) or in hospice/nursing facilities (OR, 0.04 [95% CI, 0.03–0.04]). Men had higher odds of dying at home (OR, 1.04 [95% CI, 1.04–1.05]) and in medical outpatient or emergency room settings (OR, 1.16 [95% CI, 1.15–1.16]), but lower odds of dying in hospice or nursing homes (OR, 0.63 [95% CI, 0.63–0.64]) compared with women (Figure 3). Racial differences were also evident. Black individuals

had significantly higher odds of dying in outpatient or emergency settings (OR, 1.61 [95% CI, 1.60–1.63]) compared with White individuals, but lower odds of dying in hospice or nursing facilities (OR, 0.53 [95% CI, 0.53–0.53]). Hispanics had reduced odds of dying at home (OR, 0.93 [95% CI, 0.92–0.94]) or in hospice/nursing homes (OR, 0.45 [95% CI, 0.44–0.45]) compared with non-Hispanics. Regional differences were also notable. Residents of medium-sized metropolitan areas (OR, 1.21 [95% CI, 1.20–1.21]) and rural counties (OR, 1.09 [95% CI, 1.08–1.09]) were more likely to die in hospice/nursing facilities compared with large city residents, who were more likely to die as inpatients (Figure 4).

DISCUSSION

This study, to the best of our knowledge, is the first to comprehensively evaluate HF-related mortality in the context of the place of death, utilizing data from the

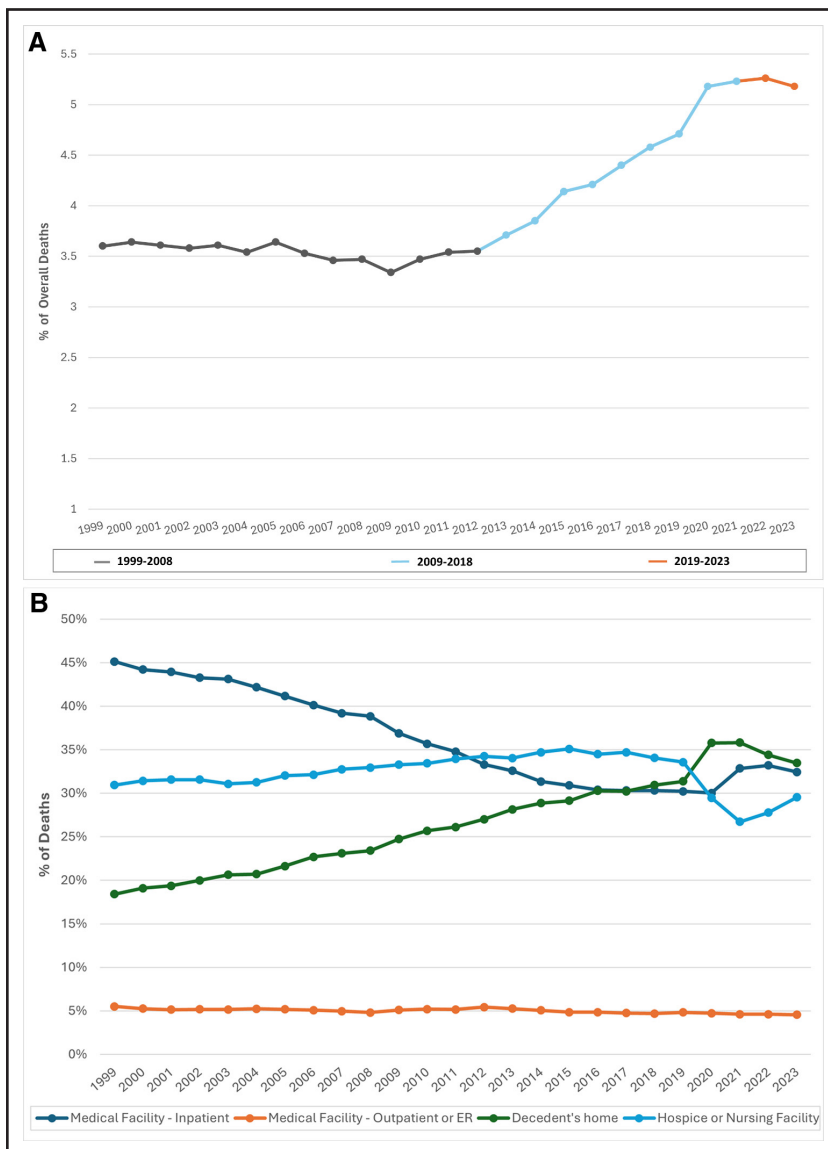


Figure 1. Temporal trends in heart failure mortality and place of death among adults in the United States, 1999–2023.

A, Annual trends in heart failure in adults. **B**, Annual trends in places of death for heart failure in adults.

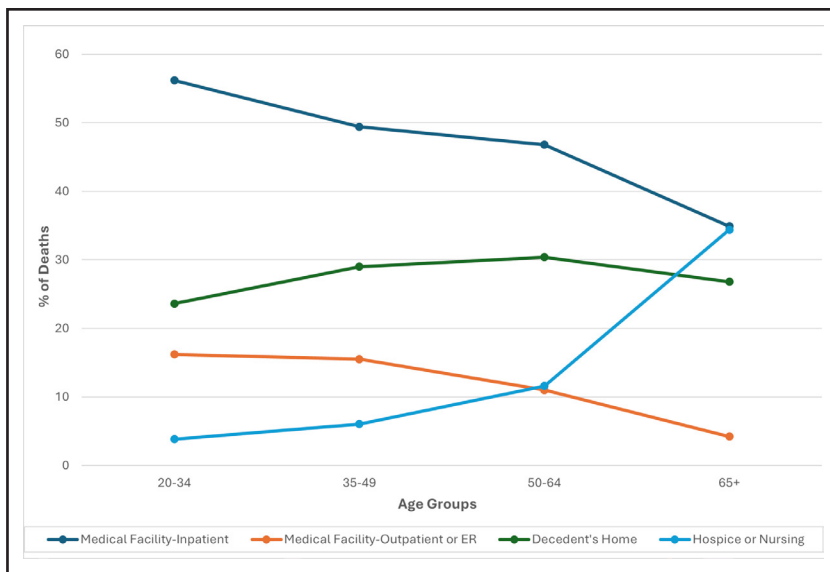


Figure 2. Trends in places of death resulting from heart failure in adults plotted across age groups.

Centers for Disease Control and Prevention's Wide-ranging Online Data for Epidemiological Research database for the years 1999 through 2023. Our analysis yielded 3 primary findings. First, while overall HF-related mortality significantly increased, deaths occurring in medical facilities—both inpatient and outpatient—declined from 1999 to 2023. Conversely, HF-related deaths at home rose substantially, eventually surpassing those in medical facilities. Deaths in hospice and nursing homes peaked in 2017 before decreasing by 2023. Second, among individuals aged 20 to 34 years, over half of HF-related deaths occurred in medical facilities, whereas only about one-third of individuals aged 65 years and older died in this setting. Third, racial disparities emerged in the place of death. While home mortality rates were comparable between White and Black populations, the latter group had significantly lower rates of hospice or nursing home deaths compared with Whites. Notably, hospice/nursing home mortality rates were similar between large metropolitan areas and noncore rural cities, suggesting effective penetration and acceptance of palliative care services in these areas despite a decrease in Medicare-certified hospice/nursing home centers from 871 in 2018 to 824 in 2022.⁹

The dramatic reversal in the previously down-trending HF-related deaths is accounted for,¹⁰ in part, by an increasing prevalence of unmanaged comorbidities namely, obesity and hypertension. A study by Alpert et al¹¹ exploring the odds of developing congestive HF as a function of duration of morbid obesity, noted the probability of developing congestive HF to be as high as 93% in individuals with >25 years of morbid obesity. The Framingham Heart Study established 2- to 3-fold increased risks of developing HF in the hypertensive population. However, managing hypertension in HF has been known to be especially challenging, with outcomes following a J-curve.¹² Simply put, both an ambitious

control of hypertension and a lack thereof are associated with worse HF-related outcomes, necessitating that a balance be struck to optimize survival. This complexity can result in suboptimal disease management culminating in poorer outcomes for this cohort. An aging population has been established as a potent cause of increased cardiovascular morbidity and mortality in the developed world.¹³ Age-related myocardial wear, increased odds of experiencing ischemic events, and a greater preponderance of HF-related risk factors, namely, hypertension, and obesity as a function of senescence, collude to negatively impact HF-related survival in the elderly. Another possible cause of this recent rise in HF-related deaths could be the increased emphasis on the Hospital Readmissions Reduction Program. The program might unintentionally influence discharge decisions, potentially impacting patients who might benefit from readmission for exacerbation management. Although there is a paucity of robust data on the impact of Hospital Readmissions Reduction Program on HF-related mortality, some studies have documented an increase in 30-day HF-related mortality rates following Hospital Readmissions Reduction Program implementation.¹⁴

A holistic review of HF-related all-cause mortality revealed a remarkable 30% increase for the duration of the study, attributable, in part, to the sudden upturn in mortality rates in 2012 following a steady decline. A finding corroborated by the existing body of literature.¹⁵ Analysis with the place of death as a co-variate revealed a few key insights. Overall inpatient deaths decreased during the duration of the study. A plausible for this change is an overall reduction in sudden cardiac death-related mortality in advanced patients with HF, as a function of an increased adoption of implantable cardioverter defibrillator therapy coupled with goal-directed medical therapy in patients with HF. The efficacy of implantable cardioverter defibrillator

Table 2. Multivariable Logistic Regression Between Decedent Characteristics and Place of Death (1999–2023)

Characteristic	OR (95% CI)	P value
Decedent's home		
Age, y		
65+	...	
20–34	0.56 (0.54–0.58)	<0.001
35–49	0.80 (0.79–0.81)	<0.001
50–64	0.86 (0.86–0.87)	<0.001
Sex		
Female	...	
Male	1.04 (1.04–1.05)	<0.001
Hispanic origin		
Non-Hispanic	...	
Hispanic	0.93 (0.92–0.94)	<0.001
Race		
White	...	
American Indian	0.96 (0.94–0.98)	0.001
Asian or Pacific Islander	0.87 (0.86–0.89)	<0.001
Black	0.76 (0.75–0.76)	<0.001
Urbanization		
Large metro	...	
Medium/small metro	1.16 (1.15–1.16)	<0.001
Rural	1.01 (1.00–1.01)	0.018
Hospice or nursing facility		
Age, y		
65+	...	
20–34	0.04 (0.03–0.04)	<0.001
35–49	0.14 (0.14–0.15)	<0.001
50–64	0.29 (0.29–0.29)	<0.001
Sex		
Female	...	
Male	0.63 (0.63–0.64)	<0.001
Hispanic origin		
Non-Hispanic	...	
Hispanic	0.45 (0.44–0.45)	<0.001
Race		
White	...	
American Indian	0.47 (0.46–0.49)	<0.001
Asian or Pacific Islander	0.41 (0.40–0.41)	<0.001
Black	0.53 (0.53–0.54)	<0.001
Urbanization		
Large metro	...	
Medium/small metro	1.21 (1.20–1.21)	<0.001
Rural	1.09 (1.08–1.09)	<0.001
Medical facility–outpatient or ER		
Age, y		
65+	...	
20–34	1.82 (1.75–1.90)	<0.001

(Continued)

Table 2. Continued

Characteristic	OR (95% CI)	P value
35–49	2.19 (2.15–2.23)	<0.001
50–64	1.74 (1.73–1.76)	<0.001
Sex		
Female	...	
Male	1.16 (1.15–1.16)	<0.001
Hispanic origin		
Non-Hispanic	...	
Hispanic	1.10 (1.08–1.11)	<0.001
Race		
White	...	
American Indian	1.04 (1.00–1.09)	0.068
Asian or Pacific Islander	1.23 (1.20–1.26)	<0.001
Black	1.61 (1.60–1.63)	<0.001
Urbanization		
Large metro	...	
Medium/small metro	1.10 (1.09–1.11)	<0.001
Rural	1.15 (1.14–1.16)	<0.001

ER indicates emergency room; metro, metropolitan area; and OR, odds ratio.

therapy in subverting sudden cardiac death has been well-recorded in the literature.¹⁶ In their 2017 article, Shen et al¹⁷ demonstrated a 44% decline in sudden death incidence in HF. They attributed this downtrend to an increasing adoption of goal-directed medical therapy in HF treatment. Similar reductions were reported by Dhande et al,¹⁸ who demonstrated the positive impact of combining goal-directed medical therapy with defibrillation therapy on mortality in HF. As depicted by Figure 1B, the statistics for deaths at the decedent's home experienced a steep upturn from 2019 onwards. This trend shift coincides with the COVID-19 outbreak, which could, in part, be credited with the change observed, as the spread of the pandemic was determined to negatively impact cardiovascular hospitalization rates. The fear of contracting the disease might have influenced decreased inpatient services, even in the setting of an exacerbation. In addition to this, a vast majority of hospitals were Babapoor et al¹⁹ reported significantly lower daily average HF-related hospital admissions in 2020 compared with 2019. A decreased availability of hospital beds, increased emphasis on high turnover of patients to decrease the length of hospital stay as a means for minimizing the risk of contracting COVID, hospitals functioning at reduced capacity, and patients choosing to seek treatment through telehealth services over traditional outpatient visits all seem to have contributed to this trend shift. Deaths occurring in the home/hospice/nursing home care settings were the lowest for the 20 to 34-year-olds (3.8%), while being the

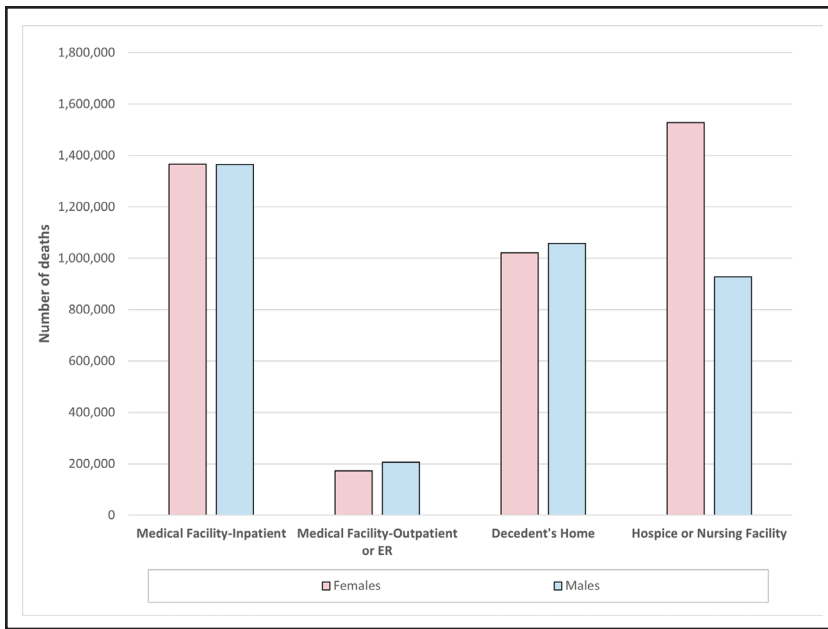


Figure 3. Sex-based differences in heart failure-related number of deaths across places of death. ER indicates emergency room.

highest for the aged 65 years cohort. To expand on this further, age-group-based stratification denoted an inverse relationship between increasing age and the odds of dying in hospital. In contrast to this article by Al-Kindi et al²⁰ that demonstrated higher odds for hospice/nursing home-based deaths in the young, we showed that the 20 to 34 years of age stratum had a higher likelihood of in-patient deaths in contrast to their older counterparts. As one of the explainers of this disparity, patients younger than 65 years of age with advanced HF are more likely to qualify for the receipt of therapeutic interventions, such as left ventricular assist devices and heart transplants.²¹ Given

their invasive nature and frequent rehospitalizations for intervention-related complications, this subset tends to suffer from greater inpatient mortality than its aged counterpart. This disproportionately low prevalence of palliative care delivery in the setting of hospice/nursing home among the Black American population has been well documented in the existing body of literature.²² Their tendency to forgo palliative care services can be attributed, in part, to their religious, spiritual, and cultural beliefs, a general mistrust of the health care delivery systems rooted in history, and an underrepresentation of Black providers in palliative and hospice/nursing home care institutions.²³

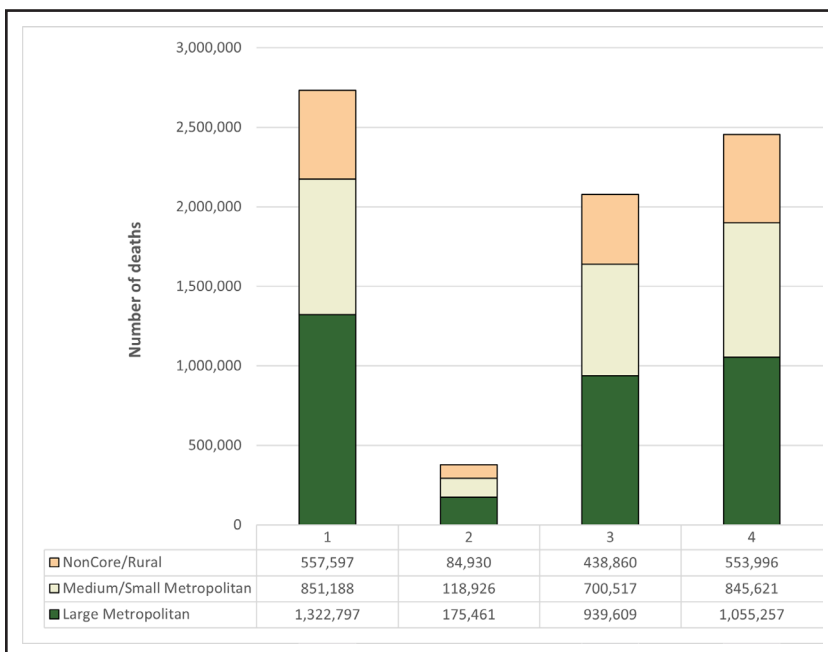


Figure 4. Urbanization-based differences in heart failure-related deaths plotted across places of death.

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Multinomial logistic regression analysis revealed that men were more likely to die in-patient (OR, 1.04 [95% CI, 1.04–1.05]), but demonstrated significantly lower odds of dying in hospice/nursing home facilities (OR, 0.63 [95% CI, 0.63–0.64]). This observation becomes particularly interesting when analyzed in the context of societal norms and inherent differences in role socialization. Traits associated with masculinity, such as restricted emotionality, self-reliance, and a greater apprehension of losing bodily autonomy and independence, may present a barrier to optimal palliative and end-of-life care delivery in a hospice/nursing home setting for men.^{24–26} Saito and colleagues²⁷ reported a statistically significant congruence between the male sex and late admission to hospice and short durations of hospice stay, both of which were established to be associated with worse survival outcomes. Women, conversely, are more likely to prefer end-of-life care, exhibiting greater compliance with palliative care goals.²⁸

An analysis of the hospice/nursing home-based HF-related mortality in the prepandemic years demonstrated a steady increase from 1999 to 2019. An increased awareness of the utility of, and emphasis on, patient-centered end-of-life care might be 1 of the key facets of this change. HF is not an isolated disease but a clinical syndrome causing detriment across a wide spectrum of somatic and psychosocial faculties, resulting in repeated hospitalizations, ultimately culminating in enormous, aggregated costs incurred by the hospitals. Therefore, effective integration of hospice/nursing home-based palliative care was recognized as a potent combat strategy and was incorporated into the consensus statements for managing HF,^{8,29,30} which might have influenced the prepandemic place-of-death trends in HF our article seeks to underscore. It is, however, imperative to mention the acute reversal of hospice/nursing home-based deaths from 2020 onwards, essentially nullifying the cumulative increment of the past 2 decades. While the utilization of hospice and palliative care services seems to be uptrending again since 2021 (Figure 1B), a lot is left to be desired.

Racial and rural disparities pose as the 2 biggest challenges to optimal and equitable HF management with hospice-based care integration. Educating patients with HF about the palliative care available to them, addressing and dispelling misconceptions, facilitating easy transition of care from the hospital to hospice and investing into expanding the existing network of Medicare-certified hospice centers into the rural towns and counties are the need of the hour. Advancements in in-patient HF management without an adequate integration of effective home health care, hospice and nursing home care will fail to deliver fitting results. Last, robust research into circumventing around the roadblocks hampering effective home/hospice-based health care is needed to expand

the current body of literature and better inform clinical decision and policy making.

LIMITATIONS

Limitations of the study include its reliance on death-certificate data abstracted from Centers for Disease Control and Prevention's Wide-ranging Online Data for epidemiological Research, which may not represent the full spectrum of end-of-life experiences for patients with HF. The study's focus on deaths due to HF may overlook individuals with HF who died from other causes, potentially leading to an incomplete understanding of end-of-life care for this population. Additionally, the use of aggregated, de-identified data limits the study's ability to account for the differences in individual-level clinical characteristics and treatment modalities, which represent crucial determinants in understanding end-of-life care for HF cohort. This may also obscure essential nuances in the circumstances surrounding deaths in different settings, potentially limiting the depth of insight. Finally, the mortality data from the Centers for Disease Control and Prevention's Wide-ranging Online Data for epidemiological Research database does not touch upon the causation of differentiation in mortality rates in races, sex, urbanization, location of death, and census region.

CONCLUSIONS

Our study highlights the evolving patterns in the locations of death among individuals with HF from 1999 to 2023. The increase in home and hospice/nursing facility deaths, alongside a decrease in inpatient deaths, underscores the shifting dynamics in end-of-life care preferences and accessibility. Significant factors influencing these trends include age, sex, ethnicity, urbanization, and health care policy and technology advancements. Addressing disparities in health care access and enhancing palliative care services are critical for improving end-of-life experiences for patients with HF. Future research should explore the sociodemographic and systemic factors shaping these trends to inform better care practices and policies.

ARTICLE INFORMATION

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Disclosures

None.

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