Racial Disparities in Heart Failure Prevalence and Mortality: insights from the National Health and Nutrition Examination Survey

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## Preamble:

* **Reference Papers:**
  + [M. Talha et al. 2024](https://journals.sagepub.com/doi/10.1177/17539447241239814)
* **Study Objective**: To examine racial and ethnic disparities in heart failure (HF) prevalence and outcomes among young to middle-aged adults in the United States.
* **Data Source**: Cross-sectional analysis of the National Health and Nutrition Examination Survey (NHANES) from 2005 to 2018.
* **Population**: Adults aged 20-64 years with self-reported heart failure.
* **Race Categories**:
  + Non-Hispanic White (NH White)
  + Non-Hispanic Black (NH Black)
  + Hispanic
* **Outcomes**:
  + Prevalence of Heart Failure
  + All-Cause Mortality
  + Cardiac Mortality
* **Statistical Analysis**: Multiple logistic regression and Cox proportional-hazards models were used to assess the independent association of race/ethnicity with heart failure (HF) prevalence and mortality outcomes, respectively, adjusted for:
  + Demographics: Age, sex, race/ethnicity, insurance coverage, and waist circumference.
  + Medical History: Hypertension, diabetes mellitus, hyperlipidemia, cancer, stroke, coronary artery disease, chronic obstructive pulmonary disease (COPD), and arthritis.
  + Lifestyle Factors: Smoking status
* **Software:** All statistical analyses were conducted using R Version 4.4.1, incorporating sampling weights, primary sampling units, and strata to ensure the accuracy and generalizability of the results.

## Baseline Table:

| **Characteristic** | **Non-Hispanic White adults** N = 1,180,184*1* | **Non-Hispanic Black adults** N = 509,966*1* | **Hispanic adults** N = 250,297*1* | **p-value***2* | **Overall** N = 1,940,447*1* |
| --- | --- | --- | --- | --- | --- |
| Age, mean (standard error) | 57 (49 – 61) | 52 (46 – 58) | 52 (44 – 60) | 0.026 | 55 (47 – 60) |
| Age groups, n (weighted %) |  |  |  | 0.68 |  |
| 20-39 | 17 (11%) | 14 (11%) | 4 (7.0%) |  | 35 (11%) |
| 40-64 | 156 (89%) | 168 (89%) | 95 (93%) |  | 419 (89%) |
| Sex, n (weighted %) |  |  |  | 0.22 |  |
| Men | 104 (57%) | 92 (47%) | 54 (55%) |  | 250 (54%) |
| Women | 69 (43%) | 90 (53%) | 45 (45%) |  | 204 (46%) |
| Education level, n (weighted %) |  |  |  | <0.001 |  |
| Less than 9th grade | 15 (6.9%) | 7 (4.3%) | 30 (30%) |  | 52 (9.2%) |
| 9-11th grade (Includes 12th grade with no diploma) | 42 (18%) | 41 (22%) | 24 (22%) |  | 107 (20%) |
| High school graduate/GED or equivalent | 48 (30%) | 55 (31%) | 19 (25%) |  | 122 (29%) |
| Some college or AA degree | 52 (34%) | 62 (34%) | 22 (18%) |  | 136 (32%) |
| College graduate or above | 16 (11%) | 17 (8.6%) | 4 (5.3%) |  | 37 (9.7%) |
| Insurance, n (weighted %) | 155 (89%) | 152 (81%) | 80 (81%) | 0.17 | 387 (86%) |
| Private, n (weighted %) | 54 (100%) | 44 (100%) | 18 (92%) | 0.039 | 116 (99%) |
| Medicare, n (weighted %) |  |  |  |  |  |
| Yes | 53 (100%) | 59 (100%) | 25 (100%) |  | 137 (100%) |
| Medicaid, n (weighted %) |  |  |  |  |  |
| Yes | 57 (100%) | 64 (100%) | 29 (100%) |  | 150 (100%) |
| BMI, n (weighted %) |  |  |  | 0.33 |  |
| <18.5 | 3 (1.2%) | 2 (1.5%) | 1 (1.3%) |  | 6 (1.3%) |
| 18.5–24.9 | 20 (11%) | 28 (18%) | 5 (7.4%) |  | 53 (13%) |
| 25–29.9 | 36 (20%) | 27 (17%) | 29 (30%) |  | 92 (20%) |
| ⩾30.0 | 100 (67%) | 109 (63%) | 53 (61%) |  | 262 (66%) |
| Waist circumference, n (weighted %) |  |  |  | 0.59 |  |
| Normal | 34 (21%) | 35 (27%) | 18 (24%) |  | 87 (23%) |
| High | 118 (79%) | 113 (73%) | 64 (76%) |  | 295 (77%) |
| Smoking status, n (weighted %) |  |  |  | 0.003 |  |
| Never | 39 (28%) | 82 (47%) | 46 (51%) |  | 167 (36%) |
| Past | 62 (36%) | 46 (22%) | 38 (29%) |  | 146 (31%) |
| Current daily/nondaily smoker | 72 (37%) | 54 (32%) | 15 (20%) |  | 141 (33%) |
| *1*Median (Q1 – Q3); n (unweighted) (%) | | | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | | | |

## Comorbidities Table:

| **Characteristic** | **Non-Hispanic White adults** N = 1,180,184*1* | **Non-Hispanic Black adults** N = 509,966*1* | **Hispanic adults** N = 250,297*1* | **p-value***2* | **Overall** N = 1,940,447*1* |
| --- | --- | --- | --- | --- | --- |
| Hypertension, n/N (weighted %) | 127/173 (72%) | 157/182 (86%) | 81/99 (81%) | 0.033 | 365/454 (77%) |
| Mean systolic blood pressure (SE) | 122 (114 – 135) | 131 (115 – 150) | 126 (115 – 137) | 0.013 | 124 (115 – 139) |
| Mean diastolic blood pressure (SE) | 71 (64 – 80) | 77 (67 – 85) | 74 (65 – 83) | 0.010 | 73 (65 – 81) |
| Diabetes, n/N (weighted %) | 72/170 (45%) | 75/173 (39%) | 51/95 (49%) | 0.48 | 198/438 (44%) |
| Hyperlipidemia, n/N (weighted %) | 103/166 (62%) | 108/169 (63%) | 53/90 (50%) | 0.22 | 264/425 (61%) |
| Cancer, n/N (weighted %) | 29/172 (19%) | 17/182 (7.0%) | 8/98 (6.0%) | 0.002 | 54/452 (14%) |
| Stroke, n/N (weighted %) | 37/173 (19%) | 28/182 (14%) | 14/98 (11%) | 0.27 | 79/453 (17%) |
| Coronary artery disease, n/N (weighted %) | 111/173 (60%) | 92/181 (50%) | 72/98 (71%) | 0.036 | 275/452 (59%) |
| COPD, n/N (weighted %) | 70/107 (60%) | 46/96 (46%) | 29/59 (47%) | 0.24 | 145/262 (55%) |
| Arthritis, n/N (weighted %) | 100/173 (59%) | 96/182 (50%) | 49/99 (39%) | 0.022 | 245/454 (54%) |
| Obesity, n/N (weighted %) | 100/159 (67%) | 109/167 (63%) | 53/89 (61%) | 0.66 | 262/415 (65%) |
| *1*n (unweighted)/N (unweighted) (%); Median (Q1 – Q3) | | | | | |
| *2*Pearson's X^2: Rao & Scott adjustment; Design-based KruskalWallis test | | | | | |

## Multivariable Logistic Regression:

### Prevalence of HF:

#### Unadjusted ORs

| **Characteristic** | **OR** **(95% CI)***1* | **p-value** |
| --- | --- | --- |
| Race/Ethnicity |  |  |
| Non-Hispanic White adults | — |  |
| Non-Hispanic Black adults | 0.69 (0.51 to 0.94) | 0.018 |
| Hispanic adults | 0.71 (0.45 to 1.11) | 0.13 |
| *1*OR = Odds Ratio, CI = Confidence Interval | | |

#### Adjusted ORs

| **Characteristic** | **OR** **(95% CI)***1* | **p-value** |
| --- | --- | --- |
| Race/Ethnicity |  |  |
| Non-Hispanic White adults | — |  |
| Non-Hispanic Black adults | 0.66 (0.39 to 1.12) | 0.11 |
| Hispanic adults | 0.70 (0.33 to 1.46) | 0.32 |
| Age | 1.00 (0.97 to 1.02) | 0.91 |
| Sex |  |  |
| Men | — |  |
| Women | 1.03 (0.64 to 1.65) | 0.91 |
| Health Insurance (Yes/No) |  |  |
| Yes | — |  |
| No | 1.06 (0.58 to 1.92) | 0.85 |
| Waist Circumference |  |  |
| Normal | — |  |
| High | 0.99 (0.50 to 1.96) | 0.98 |
| Smoking Status |  |  |
| Never | — |  |
| Past | 0.92 (0.52 to 1.63) | 0.75 |
| Current daily/nondaily smoker | 0.93 (0.53 to 1.61) | 0.77 |
| Hypertension | 1.05 (0.61 to 1.81) | 0.85 |
| Diabetes Mellitus | 0.96 (0.64 to 1.44) | 0.83 |
| Hyperlipidemia | 1.06 (0.68 to 1.64) | 0.79 |
| Cancer | 1.06 (0.58 to 1.91) | 0.85 |
| Stroke | 1.00 (0.60 to 1.65) | 0.99 |
| Coronary Artery Disease | 0.93 (0.58 to 1.49) | 0.75 |
| Chronic Obstructive Pulmonary Disease | 0.95 (0.61 to 1.48) | 0.82 |
| Arthritis | 0.98 (0.66 to 1.46) | 0.91 |
| Obesity | 1.06 (0.58 to 1.95) | 0.83 |
| *1*OR = Odds Ratio, CI = Confidence Interval | | |

## Cox Proportional Hazards Model

### All-Cause Mortality

#### Unadjusted HRs

#### Adjusted HRs

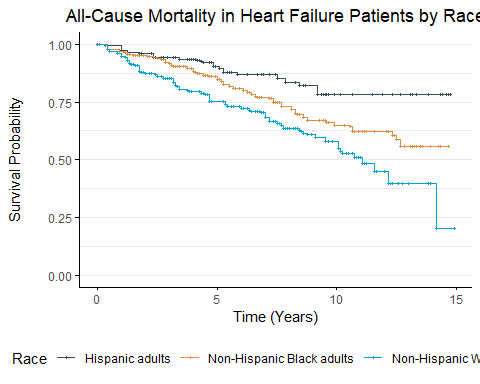
### Cardiac Mortality

#### Unadjusted HRs

#### Adjusted HRs

## Kaplan-Meier Curves:

### All-Cause Mortality:



### Cardiac Mortality:

