Racial and Ethnic Disparities in the Utilization of Mechanical Circulatory Support for Cardiogenic Shock Following Acute Myocardial Infarction

NIS Analysis for the RCOP Match Mentorship Program

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## Preamble:

* **Reference Studies:**
  + [Modi et al., 2024](https://www.jacc.org/doi/10.1016/j.jacc.2024.09.316)
* **Study Objective:** To examine racial and ethnic disparities in in-hospital outcomes, healthcare resource utilization, and the use of mechanical circulatory support (MCS) among patients hospitalized with acute myocardial infarction (AMI) complicated by cardiogenic shock (CS), using a nationally representative U.S. database.
* **Data Source:** Retrospective cross-sectional analysis of the National Inpatient Sample (NIS) from 2018 to 2020. The NIS is maintained by the Healthcare Cost and Utilization Project (HCUP) and provides a stratified, nationally representative sample of U.S. inpatient hospital discharges across all payers.
* **Cohort Definition:** Patients were included if they met the following criteria
  + Age ≥18 years
  + Diagnosis of acute myocardial infarction (AMI): ICD-10-CM codes I21.0–I21.4 (I21.9 was excluded to avoid unspecified AMI)
  + Concurrent diagnosis of cardiogenic shock: ICD-10-CM code R57.0
  + Non-missing values for AMI type and race/ethnicity
  + **Exclusions:** if transferred into or out of the hospital, to ensure full capture of the index hospitalization
* **Exposure of Interest:** Patient race and ethnicity, categorized as
  + White (reference group)
  + Black
  + Hispanic
  + Asian or Pacific Islander
  + Other
* **Outcomes of Interest:**
  + **Primary Outcome:**
    - In-hospital mortality
  + **Secondary Outcomes:**
    - Length of stay (LOS), in days
    - Inflation-adjusted total hospital charges (in 2020 USD)
    - Use of mechanical circulatory support (ECMO, IABP, VAD)
    - Favorable discharge (defined as routine discharge to home or home health care)
    - Acute kidney injury (AKI) or receipt of hemodialysis
    - Sepsis
* **Outcome Definitions (ICD-10-CM/PCS Codes):**
  + Acute Myocardial Infarction (AMI):
    - ICD-10-CM: I21.0–I21.4
    - Excluded: I21.9 (unspecified AMI)
  + Cardiogenic Shock:
    - ICD-10-CM: R57.0
  + Percutaneous Coronary Intervention (PCI):
    - ICD-10-PCS: A comprehensive list including codes such as  
      02703ZZ, 02713ZZ, 02723ZZ, 02733ZZ, and others representing balloon angioplasty and stent placement across multiple coronary sites
  + Mechanical Circulatory Support (MCS):
    - ICD-10-PCS:
      * IABP: 5A02110, 5A02210
      * Short-term VADs: 5A02115, 5A02116, 5A0211D, 5A02215, 5A02216, 5A0221D
      * ECMO: 5A0920Z, 5A15223, 5A1522F, 5A1522G, 5A1522H
  + Acute Kidney Injury (AKI):
    - ICD-10-CM: N17.x
  + Hemodialysis Procedures:
    - ICD-10-PCS: 5A1D00Z, 5A1D60Z, 5A1D70Z, 5A1D80Z, 5A1D90Z
  + Sepsis:
    - ICD-10-CM: A wide range of codes including  
      A021, A40.x, A41.x, R6520, R6521, T8112XA, T8144XA, and obstetric/pediatric-specific codes such as O85, P360, etc.
* **Covariates for Adjustment:** All regression models adjusted for the following
  + **Demographic Factors:** Age (continuous), sex, race/ethnicity
  + **Socioeconomic Factors:** Primary payer, ZIP code–based income quartile
  + **Clinical Factors:** Type of AMI (STEMI vs NSTEMI), receipt of PCI, number of comorbidities (Elixhauser index), APR-DRG risk of mortality score
  + **Hospital-Level Factors:** Hospital region, bed size, and teaching status/location
* **Statistical Methods:**
  + **Univariable Analysis:**
    - Categorical variables: Compared using Pearson’s chi-square test with Rao & Scott adjustment
    - Continuous variables: Analyzed using the design-based Kruskal–Wallis test, a non-parametric alternative suitable for survey-weighted data
  + **Multivariable Analysis:**
    - Binary outcomes (e.g., mortality, MCS, AKI, sepsis, favorable discharge): Survey-weighted logistic regression using the quasibinomial family
    - Continuous outcomes (e.g., LOS, hospital charges): Survey-weighted linear regression using the gaussian family
    - Results reported as adjusted odds ratios (aORs) or beta coefficients with 95% confidence intervals
* **Software:** All statistical analyses were performed using the R Statistical Language (Version 4.5.0; R Foundation for Statistical Computing, Vienna, Austria), incorporating survey-weighted procedures via the *survey* package to account for the complex sampling design of NIS.

## Baseline table:

| **Characteristic** | **Overall** N = 89,125*1* | **White** N = 61,395*1* | **Asian or Pacific Islander** N = 4,205*1* | **Black** N = 9,490*1* | **Hispanic** N = 9,825*1* | **Other** N = 4,210*1* | **p-value***2* |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Age, y | 68 (13) | 69 (13) | 68 (13) | 64 (14) | 66 (13) | 66 (13) | <0.001 |
| Sex |  |  |  |  |  |  | <0.001 |
| Female | 31,500 (35%) | 21,415 (35%) | 1,270 (30%) | 4,130 (44%) | 3,390 (35%) | 1,295 (31%) |  |
| Male | 57,620 (65%) | 39,975 (65%) | 2,935 (70%) | 5,360 (56%) | 6,435 (65%) | 2,915 (69%) |  |
| Type of MI |  |  |  |  |  |  | <0.001 |
| NSTEMI | 42,185 (47%) | 28,405 (46%) | 2,040 (49%) | 5,250 (55%) | 4,800 (49%) | 1,690 (40%) |  |
| STEMI of anterior wall | 18,455 (21%) | 12,780 (21%) | 955 (23%) | 1,745 (18%) | 1,935 (20%) | 1,040 (25%) |  |
| STEMI of inferior wall | 18,670 (21%) | 13,595 (22%) | 830 (20%) | 1,390 (15%) | 1,935 (20%) | 920 (22%) |  |
| STEMI of other sites | 2,920 (3.3%) | 2,125 (3.5%) | 90 (2.1%) | 300 (3.2%) | 260 (2.6%) | 145 (3.4%) |  |
| STEMI of unspecified site | 6,895 (7.7%) | 4,490 (7.3%) | 290 (6.9%) | 805 (8.5%) | 895 (9.1%) | 415 (9.9%) |  |
| Percutaneous coronary intervention (PCI) | 43,880 (49%) | 31,315 (51%) | 2,100 (50%) | 3,680 (39%) | 4,675 (48%) | 2,110 (50%) | <0.001 |
| Insurance payer |  |  |  |  |  |  | <0.001 |
| Medicaid | 9,445 (11%) | 4,640 (7.6%) | 675 (16%) | 1,535 (16%) | 1,880 (19%) | 715 (17%) |  |
| Medicare | 53,030 (60%) | 38,490 (63%) | 2,150 (51%) | 5,205 (55%) | 5,075 (52%) | 2,110 (50%) |  |
| Other | 7,585 (8.5%) | 4,655 (7.6%) | 380 (9.0%) | 930 (9.8%) | 1,130 (12%) | 490 (12%) |  |
| Private | 18,920 (21%) | 13,505 (22%) | 1,000 (24%) | 1,785 (19%) | 1,735 (18%) | 895 (21%) |  |
| Income quartile |  |  |  |  |  |  | <0.001 |
| $1 - $51,999 | 26,155 (30%) | 15,825 (26%) | 535 (13%) | 4,790 (52%) | 3,845 (40%) | 1,160 (28%) |  |
| $52,000 - $65,999 | 22,775 (26%) | 16,620 (28%) | 785 (19%) | 2,180 (23%) | 2,300 (24%) | 890 (22%) |  |
| $66,000 - $87,999 | 21,220 (24%) | 15,620 (26%) | 1,055 (26%) | 1,440 (15%) | 2,125 (22%) | 980 (24%) |  |
| $88,000 or more | 17,310 (20%) | 12,295 (20%) | 1,755 (42%) | 885 (9.5%) | 1,275 (13%) | 1,100 (27%) |  |
| Hospital region |  |  |  |  |  |  | <0.001 |
| Midwest | 17,280 (19%) | 14,255 (23%) | 390 (9.3%) | 1,790 (19%) | 485 (4.9%) | 360 (8.6%) |  |
| Northeast | 12,530 (14%) | 8,930 (15%) | 480 (11%) | 1,235 (13%) | 1,085 (11%) | 800 (19%) |  |
| South | 37,315 (42%) | 25,080 (41%) | 765 (18%) | 5,360 (56%) | 4,350 (44%) | 1,760 (42%) |  |
| West | 22,000 (25%) | 13,130 (21%) | 2,570 (61%) | 1,105 (12%) | 3,905 (40%) | 1,290 (31%) |  |
| Hospital bedsize |  |  |  |  |  |  | 0.058 |
| Large | 48,005 (54%) | 33,070 (54%) | 2,390 (57%) | 5,300 (56%) | 5,020 (51%) | 2,225 (53%) |  |
| Medium | 27,135 (30%) | 18,515 (30%) | 1,085 (26%) | 2,810 (30%) | 3,325 (34%) | 1,400 (33%) |  |
| Small | 13,985 (16%) | 9,810 (16%) | 730 (17%) | 1,380 (15%) | 1,480 (15%) | 585 (14%) |  |
| Hospital location/teaching status |  |  |  |  |  |  | <0.001 |
| Rural | 4,140 (4.6%) | 3,630 (5.9%) | 30 (0.7%) | 310 (3.3%) | 90 (0.9%) | 80 (1.9%) |  |
| Urban, non-teaching | 16,560 (19%) | 11,505 (19%) | 920 (22%) | 1,335 (14%) | 1,915 (19%) | 885 (21%) |  |
| Urban, teaching | 68,425 (77%) | 46,260 (75%) | 3,255 (77%) | 7,845 (83%) | 7,820 (80%) | 3,245 (77%) |  |
| APR-DRG risk of mortality |  |  |  |  |  |  | <0.001 |
| Extreme | 78,220 (88%) | 53,510 (87%) | 3,730 (89%) | 8,635 (91%) | 8,740 (89%) | 3,605 (86%) |  |
| Major | 8,970 (10%) | 6,445 (10%) | 395 (9.4%) | 705 (7.4%) | 915 (9.3%) | 510 (12%) |  |
| Moderate | 1,935 (2.2%) | 1,440 (2.3%) | 80 (1.9%) | 150 (1.6%) | 170 (1.7%) | 95 (2.3%) |  |
| No. of comorbidities |  |  |  |  |  |  | <0.001 |
| One comorbidity | 9,285 (10%) | 6,845 (11%) | 485 (12%) | 655 (6.9%) | 845 (8.6%) | 455 (11%) |  |
| Two or more comorbidities | 79,840 (90%) | 54,550 (89%) | 3,720 (88%) | 8,835 (93%) | 8,980 (91%) | 3,755 (89%) |  |
| *1*Mean (SD); n (%) | | | | | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | | | | | |

## Univariable analysis:

| **Characteristic** | **Overall** N = 89,125*1* | **White** N = 61,395*1* | **Asian or Pacific Islander** N = 4,205*1* | **Black** N = 9,490*1* | **Hispanic** N = 9,825*1* | **Other** N = 4,210*1* | **p-value***2* |
| --- | --- | --- | --- | --- | --- | --- | --- |
| In-hospital mortality | 43,580 (49%) | 30,220 (49%) | 1,980 (47%) | 4,940 (52%) | 4,500 (46%) | 1,940 (46%) | <0.001 |
| Length of stay (days) | 5 (2, 9) | 5 (2, 9) | 5 (2, 10) | 6 (2, 11) | 6 (3, 11) | 5 (2, 9) | <0.001 |
| Inflation-adjusted total charge ($) | 144,893 (76,975, 261,811) | 134,346 (71,981, 241,256) | 176,731 (100,236, 316,553) | 140,699 (73,964, 255,476) | 196,202 (109,794, 364,077) | 163,226 (88,219, 327,612) | <0.001 |
| Mechanical circulatory support | 30,225 (34%) | 20,665 (34%) | 1,650 (39%) | 2,815 (30%) | 3,485 (35%) | 1,610 (38%) | <0.001 |
| Favorable discharge | 44,740 (50%) | 30,640 (50%) | 2,205 (52%) | 4,390 (46%) | 5,280 (54%) | 2,225 (53%) | <0.001 |
| Acute kidney injury/hemodialysis | 50,965 (57%) | 33,480 (55%) | 2,655 (63%) | 6,480 (68%) | 6,035 (61%) | 2,315 (55%) | <0.001 |
| Sepsis | 18,360 (21%) | 11,805 (19%) | 950 (23%) | 2,315 (24%) | 2,355 (24%) | 935 (22%) | <0.001 |
| *1*n (%); Median (Q1, Q3) | | | | | | | |
| *2*Pearson's X^2: Rao & Scott adjustment; Design-based KruskalWallis test | | | | | | | |

## Multivariable logistic regression:

### In-hospital mortality:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.95 | 0.81, 1.12 | 0.5 |
| Black | 1.07 | 0.96, 1.21 | 0.2 |
| Hispanic | 0.86 | 0.76, 0.96 | 0.009 |
| Other | 0.93 | 0.79, 1.09 | 0.4 |
| Age, y | 1.04 | 1.04, 1.04 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.82 | 0.76, 0.88 | <0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 1.60 | 1.45, 1.77 | <0.001 |
| STEMI of inferior wall | 1.36 | 1.24, 1.50 | <0.001 |
| STEMI of other sites | 1.94 | 1.60, 2.35 | <0.001 |
| STEMI of unspecified site | 2.38 | 2.08, 2.73 | <0.001 |
| Percutaneous coronary intervention (PCI) |  |  |  |
| No | — | — |  |
| Yes | 0.41 | 0.38, 0.44 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 1.09 | 0.96, 1.24 | 0.2 |
| Other | 1.14 | 0.97, 1.33 | 0.12 |
| Private | 0.83 | 0.72, 0.94 | 0.004 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.87 | 0.80, 0.95 | 0.003 |
| $66,000 - $87,999 | 0.96 | 0.87, 1.05 | 0.4 |
| $88,000 or more | 0.82 | 0.74, 0.90 | <0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.16 | 1.03, 1.30 | 0.015 |
| South | 1.02 | 0.92, 1.12 | 0.7 |
| West | 1.01 | 0.90, 1.12 | 0.9 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.14 | 1.05, 1.23 | 0.002 |
| Small | 1.13 | 1.02, 1.25 | 0.016 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.92 | 0.77, 1.10 | 0.3 |
| Urban, teaching | 0.84 | 0.71, 1.00 | 0.049 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.19 | 0.17, 0.22 | <0.001 |
| Moderate | 0.16 | 0.11, 0.23 | <0.001 |
| Elixhauser comorbidity index | 1.08 | 1.07, 1.10 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Mechanical circulatory support:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.35 | 1.14, 1.60 | <0.001 |
| Black | 0.90 | 0.80, 1.01 | 0.086 |
| Hispanic | 1.15 | 1.01, 1.30 | 0.031 |
| Other | 1.23 | 1.04, 1.45 | 0.016 |
| Age, y | 0.99 | 0.98, 0.99 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.40 | 1.30, 1.51 | <0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 2.39 | 2.16, 2.64 | <0.001 |
| STEMI of inferior wall | 1.18 | 1.06, 1.31 | 0.002 |
| STEMI of other sites | 1.86 | 1.53, 2.26 | <0.001 |
| STEMI of unspecified site | 1.62 | 1.42, 1.85 | <0.001 |
| Percutaneous coronary intervention (PCI) |  |  |  |
| No | — | — |  |
| Yes | 3.73 | 3.42, 4.06 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 1.10 | 0.97, 1.26 | 0.14 |
| Other | 1.06 | 0.90, 1.25 | 0.5 |
| Private | 1.20 | 1.05, 1.37 | 0.008 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.01 | 0.92, 1.11 | 0.8 |
| $66,000 - $87,999 | 1.04 | 0.94, 1.16 | 0.4 |
| $88,000 or more | 1.04 | 0.93, 1.16 | 0.5 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.00 | 0.88, 1.15 | >0.9 |
| South | 0.97 | 0.88, 1.08 | 0.6 |
| West | 0.83 | 0.74, 0.93 | 0.002 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.84 | 0.76, 0.92 | <0.001 |
| Small | 0.71 | 0.63, 0.79 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.21 | 0.98, 1.50 | 0.077 |
| Urban, teaching | 1.65 | 1.35, 2.01 | <0.001 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.27 | 0.24, 0.31 | <0.001 |
| Moderate | 0.07 | 0.04, 0.09 | <0.001 |
| Elixhauser comorbidity index | 0.97 | 0.95, 0.98 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Favorable discharge:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.09 | 0.93, 1.27 | 0.3 |
| Black | 0.91 | 0.81, 1.03 | 0.13 |
| Hispanic | 1.22 | 1.08, 1.37 | <0.001 |
| Other | 1.08 | 0.92, 1.26 | 0.4 |
| Age, y | 0.96 | 0.96, 0.97 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.19 | 1.11, 1.27 | <0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 0.64 | 0.58, 0.71 | <0.001 |
| STEMI of inferior wall | 0.74 | 0.67, 0.82 | <0.001 |
| STEMI of other sites | 0.53 | 0.44, 0.64 | <0.001 |
| STEMI of unspecified site | 0.42 | 0.37, 0.49 | <0.001 |
| Percutaneous coronary intervention (PCI) |  |  |  |
| No | — | — |  |
| Yes | 2.47 | 2.28, 2.67 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.96 | 0.84, 1.09 | 0.5 |
| Other | 0.90 | 0.77, 1.05 | 0.2 |
| Private | 1.30 | 1.13, 1.48 | <0.001 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.16 | 1.06, 1.27 | <0.001 |
| $66,000 - $87,999 | 1.06 | 0.97, 1.16 | 0.2 |
| $88,000 or more | 1.27 | 1.15, 1.41 | <0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.87 | 0.77, 0.98 | 0.021 |
| South | 0.99 | 0.90, 1.09 | 0.8 |
| West | 0.97 | 0.87, 1.08 | 0.6 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.87 | 0.80, 0.94 | <0.001 |
| Small | 0.89 | 0.80, 0.98 | 0.017 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.05 | 0.87, 1.25 | 0.6 |
| Urban, teaching | 1.16 | 0.98, 1.38 | 0.085 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 4.71 | 4.13, 5.38 | <0.001 |
| Moderate | 5.87 | 4.14, 8.33 | <0.001 |
| Elixhauser comorbidity index | 0.92 | 0.91, 0.93 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Acute kidney injury/hemodialysis:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.39 | 1.18, 1.64 | <0.001 |
| Black | 1.59 | 1.40, 1.79 | <0.001 |
| Hispanic | 1.26 | 1.12, 1.42 | <0.001 |
| Other | 1.04 | 0.88, 1.21 | 0.7 |
| Age, y | 1.01 | 1.01, 1.01 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.36 | 1.26, 1.46 | <0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 0.68 | 0.62, 0.75 | <0.001 |
| STEMI of inferior wall | 0.71 | 0.65, 0.79 | <0.001 |
| STEMI of other sites | 0.75 | 0.62, 0.90 | 0.003 |
| STEMI of unspecified site | 0.76 | 0.67, 0.86 | <0.001 |
| Percutaneous coronary intervention (PCI) |  |  |  |
| No | — | — |  |
| Yes | 0.76 | 0.70, 0.82 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.98 | 0.86, 1.12 | 0.8 |
| Other | 0.97 | 0.83, 1.14 | 0.8 |
| Private | 0.89 | 0.78, 1.01 | 0.077 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.10 | 1.01, 1.21 | 0.038 |
| $66,000 - $87,999 | 1.12 | 1.02, 1.23 | 0.022 |
| $88,000 or more | 1.10 | 0.99, 1.22 | 0.068 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.21 | 1.07, 1.37 | 0.003 |
| South | 1.04 | 0.94, 1.14 | 0.5 |
| West | 1.02 | 0.92, 1.14 | 0.7 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.97 | 0.89, 1.05 | 0.4 |
| Small | 0.97 | 0.88, 1.08 | 0.6 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.39 | 1.16, 1.66 | <0.001 |
| Urban, teaching | 1.46 | 1.24, 1.72 | <0.001 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.18 | 0.15, 0.20 | <0.001 |
| Moderate | 0.00 | 0.00, 0.00 | <0.001 |
| Elixhauser comorbidity index | 1.33 | 1.31, 1.35 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Sepsis:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.15 | 0.96, 1.38 | 0.13 |
| Black | 1.06 | 0.93, 1.20 | 0.4 |
| Hispanic | 1.18 | 1.04, 1.34 | 0.010 |
| Other | 1.28 | 1.05, 1.55 | 0.012 |
| Age, y | 1.00 | 1.00, 1.00 | 0.7 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.91 | 0.84, 0.99 | 0.032 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 0.64 | 0.56, 0.72 | <0.001 |
| STEMI of inferior wall | 0.52 | 0.45, 0.59 | <0.001 |
| STEMI of other sites | 0.62 | 0.48, 0.81 | <0.001 |
| STEMI of unspecified site | 0.71 | 0.61, 0.82 | <0.001 |
| Percutaneous coronary intervention (PCI) |  |  |  |
| No | — | — |  |
| Yes | 0.50 | 0.46, 0.55 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.98 | 0.85, 1.14 | 0.8 |
| Other | 0.95 | 0.79, 1.15 | 0.6 |
| Private | 0.86 | 0.73, 1.00 | 0.050 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.97 | 0.87, 1.08 | 0.6 |
| $66,000 - $87,999 | 0.93 | 0.83, 1.04 | 0.2 |
| $88,000 or more | 0.87 | 0.76, 0.99 | 0.029 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.23 | 1.07, 1.42 | 0.004 |
| South | 1.08 | 0.97, 1.21 | 0.2 |
| West | 1.20 | 1.06, 1.36 | 0.004 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.14 | 1.04, 1.26 | 0.005 |
| Small | 1.16 | 1.03, 1.30 | 0.013 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.07 | 0.85, 1.35 | 0.6 |
| Urban, teaching | 1.02 | 0.82, 1.26 | 0.9 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.01 | 0.00, 0.03 | <0.001 |
| Moderate | 0.00 | 0.00, 0.00 | <0.001 |
| Elixhauser comorbidity index | 1.13 | 1.11, 1.15 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

## Multivariable linear regression:

### Length of stay:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.1 | 0.46, 1.8 | <0.001 |
| Black | 0.50 | 0.10, 0.91 | 0.015 |
| Hispanic | 1.3 | 0.78, 1.7 | <0.001 |
| Other | 0.54 | -0.06, 1.2 | 0.080 |
| Age, y | -0.06 | -0.07, -0.05 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.72 | 0.50, 0.95 | <0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | -1.5 | -1.9, -1.2 | <0.001 |
| STEMI of inferior wall | -2.3 | -2.6, -2.0 | <0.001 |
| STEMI of other sites | -1.9 | -2.4, -1.3 | <0.001 |
| STEMI of unspecified site | -2.4 | -2.8, -1.9 | <0.001 |
| Percutaneous coronary intervention (PCI) |  |  |  |
| No | — | — |  |
| Yes | 0.48 | 0.21, 0.74 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | -1.7 | -2.3, -1.1 | <0.001 |
| Other | -1.2 | -1.9, -0.55 | <0.001 |
| Private | -1.0 | -1.6, -0.48 | <0.001 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.42 | 0.11, 0.73 | 0.007 |
| $66,000 - $87,999 | 0.38 | 0.06, 0.71 | 0.020 |
| $88,000 or more | 0.48 | 0.15, 0.81 | 0.004 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.3 | 0.90, 1.7 | <0.001 |
| South | 0.51 | 0.20, 0.82 | 0.001 |
| West | -0.07 | -0.44, 0.30 | 0.7 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -0.89 | -1.2, -0.60 | <0.001 |
| Small | -1.2 | -1.5, -0.85 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.92 | 0.42, 1.4 | <0.001 |
| Urban, teaching | 1.6 | 1.2, 2.1 | <0.001 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | -1.3 | -1.5, -1.1 | <0.001 |
| Moderate | -1.9 | -2.2, -1.5 | <0.001 |
| Elixhauser comorbidity index | 0.66 | 0.60, 0.71 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |

### Inflation-adjusted total charge:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 33,737 | 8,954, 58,520 | 0.008 |
| Black | -1,384 | -13,602, 10,834 | 0.8 |
| Hispanic | 53,770 | 39,307, 68,233 | <0.001 |
| Other | 31,231 | 13,406, 49,056 | <0.001 |
| Age, y | -1,997 | -2,344, -1,650 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 28,502 | 21,911, 35,093 | <0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | -7,185 | -17,553, 3,182 | 0.2 |
| STEMI of inferior wall | -35,612 | -44,815, -26,410 | <0.001 |
| STEMI of other sites | -19,981 | -36,096, -3,865 | 0.015 |
| STEMI of unspecified site | -13,317 | -25,971, -662 | 0.039 |
| Percutaneous coronary intervention (PCI) |  |  |  |
| No | — | — |  |
| Yes | 64,370 | 56,259, 72,481 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | -18,984 | -33,001, -4,967 | 0.008 |
| Other | -4,223 | -21,849, 13,402 | 0.6 |
| Private | 2,723 | -12,605, 18,051 | 0.7 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 4,601 | -4,709, 13,911 | 0.3 |
| $66,000 - $87,999 | 3,453 | -6,728, 13,633 | 0.5 |
| $88,000 or more | 16,453 | 4,357, 28,549 | 0.008 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 45,662 | 31,727, 59,598 | <0.001 |
| South | 52,144 | 42,717, 61,571 | <0.001 |
| West | 95,037 | 80,670, 109,404 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -24,844 | -35,587, -14,100 | <0.001 |
| Small | -36,145 | -49,129, -23,161 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 57,785 | 43,849, 71,722 | <0.001 |
| Urban, teaching | 71,912 | 60,069, 83,755 | <0.001 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | -38,223 | -46,135, -30,312 | <0.001 |
| Moderate | -70,911 | -82,980, -58,842 | <0.001 |
| Elixhauser comorbidity index | 16,690 | 14,750, 18,631 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |