The Impact of Body Mass Index on Mortality in Patients Hospitalized with Atrial Fibrillation: Insights from the National Inpatient Sample

Analysis for RCOP NIS IM5

Ali Salman

## Preamble:

* **Reference Papers:**
  + [Bhonsale et al. (2024)](https://doi.org/10.1161/JAHA.123.032550)
* **Study Objective**: Investigate the influence of body mass index (BMI) on inpatient admissions with a history of atrial fibrillation (A-Fib).
* **Data Source**: Cross-sectional analysis of the National Inpatient Sample (NIS) from 2018 to 2020.
* **Patient Selection**: Included all inpatient admissions with an ICD-10 diagnosis code for BMI and A-Fib.
* **Primary Outcomes**:
  + In-hospital all-cause mortality
  + Total hospital length of stay (days)
  + Total charge, inflation adjusted to 2020 ($) [adjusted to 2020 dollars, using CPI data by the U.S. Bureau of Labor Statistics]
* **Statistical Analysis**: Multiple logistic and linear regression to determine the independent association of BMI on outcomes, adjusted for:
  + Demographics: Age, sex, race, insurance, residential income, residential region, hospital location/teaching status, and hospital census region.
  + Medical History: Atrial fibrillation present.
  + Comorbidities: Charlson comorbidity index, cancer, coronary artery disease, cerebrovascular disease, heart failure, chronic kidney disease, chronic obstructive pulmonary disease, diabetes mellitus, hypertension, hyperlipidemia, liver disease, peripheral vascular disease, sleep apnea, valvular heart disease, alcohol use, and smoking status.
* **Software:** All analyses were performed using R Version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria)

## Baseline Table:

| **Characteristic** | **Overall**, N = 2,714,675 | **Normal weight (BMI 20.0-24.9kg/m²)**, N = 221,470 | **Class I obesity (BMI 30.0-34.9kg/m²)**, N = 523,385 | **Class II obesity (BMI 35.0-39.9kg/m²)**, N = 463,110 | **Class III obesity (BMI ≥40.0kg/m²)**, N = 925,395 | **Overweight (BMI 25.0-29.9kg/m²)**, N = 240,450 | **Underweight (BMI ≤19.9kg/m²)**, N = 340,865 | **p-value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Age, y | 71 (12) | 78 (11) | 72 (11) | 69 (11) | 66 (11) | 75 (11) | 78 (11) | <0.001 |
| Sex |  |  |  |  |  |  |  | <0.001 |
| Female | 1,339,980 (49%) | 99,405 (45%) | 219,470 (42%) | 210,625 (45%) | 511,675 (55%) | 102,690 (43%) | 196,115 (58%) |  |
| Male | 1,374,625 (51%) | 122,050 (55%) | 303,895 (58%) | 252,485 (55%) | 413,710 (45%) | 137,755 (57%) | 144,730 (42%) |  |
| Race |  |  |  |  |  |  |  | <0.001 |
| White | 2,081,560 (78%) | 168,585 (78%) | 411,310 (80%) | 360,135 (79%) | 699,650 (77%) | 183,850 (78%) | 258,030 (77%) |  |
| Asian or Pacific Islander | 40,625 (1.5%) | 6,270 (2.9%) | 5,775 (1.1%) | 3,765 (0.8%) | 6,600 (0.7%) | 4,475 (1.9%) | 13,740 (4.1%) |  |
| Black | 319,255 (12%) | 22,925 (11%) | 51,200 (10.0%) | 51,875 (11%) | 130,355 (14%) | 24,640 (10%) | 38,260 (11%) |  |
| Hispanic | 153,565 (5.8%) | 13,015 (6.0%) | 32,825 (6.4%) | 27,465 (6.1%) | 48,390 (5.4%) | 16,345 (6.9%) | 15,525 (4.6%) |  |
| Native American | 10,525 (0.4%) | 600 (0.3%) | 1,915 (0.4%) | 1,745 (0.4%) | 4,445 (0.5%) | 690 (0.3%) | 1,130 (0.3%) |  |
| Other | 49,990 (1.9%) | 4,880 (2.3%) | 9,440 (1.8%) | 8,100 (1.8%) | 15,045 (1.7%) | 5,290 (2.2%) | 7,235 (2.2%) |  |
| Charlson comorbidity index | 3.40 (2.27) | 3.54 (2.37) | 3.30 (2.29) | 3.33 (2.26) | 3.48 (2.19) | 3.51 (2.37) | 3.27 (2.26) | <0.001 |
| Healthcare insurance |  |  |  |  |  |  |  | <0.001 |
| Private | 463,980 (17%) | 21,460 (9.7%) | 92,785 (18%) | 94,165 (20%) | 195,460 (21%) | 30,680 (13%) | 29,430 (8.6%) |  |
| Medicaid | 188,575 (7.0%) | 9,250 (4.2%) | 28,595 (5.5%) | 30,785 (6.7%) | 92,840 (10%) | 11,540 (4.8%) | 15,565 (4.6%) |  |
| Medicare | 2,004,810 (74%) | 186,415 (84%) | 390,525 (75%) | 327,250 (71%) | 617,295 (67%) | 193,165 (80%) | 290,160 (85%) |  |
| Other | 55,335 (2.0%) | 4,235 (1.9%) | 11,145 (2.1%) | 10,585 (2.3%) | 18,950 (2.0%) | 4,920 (2.0%) | 5,500 (1.6%) |  |
| Residential income |  |  |  |  |  |  |  | <0.001 |
| $1 - $51,999 | 770,925 (29%) | 57,435 (26%) | 139,920 (27%) | 129,920 (28%) | 287,285 (31%) | 64,290 (27%) | 92,075 (27%) |  |
| $52,000 - $65,999 | 746,850 (28%) | 56,205 (26%) | 142,430 (28%) | 130,145 (29%) | 267,905 (29%) | 63,710 (27%) | 86,455 (26%) |  |
| $66,000 - $87,999 | 653,440 (24%) | 52,820 (24%) | 130,875 (25%) | 112,855 (25%) | 218,500 (24%) | 58,595 (25%) | 79,795 (24%) |  |
| $88,000 or more | 504,760 (19%) | 51,775 (24%) | 102,870 (20%) | 83,460 (18%) | 138,660 (15%) | 50,550 (21%) | 77,445 (23%) |  |
| Residential region |  |  |  |  |  |  |  | <0.001 |
| Large metro | 1,386,225 (51%) | 123,920 (56%) | 271,340 (52%) | 231,325 (50%) | 442,350 (48%) | 131,255 (55%) | 186,035 (55%) |  |
| Micropolitan | 467,390 (17%) | 32,990 (15%) | 88,440 (17%) | 82,505 (18%) | 176,670 (19%) | 36,170 (15%) | 50,615 (15%) |  |
| Small metro | 854,025 (32%) | 63,800 (29%) | 162,370 (31%) | 148,245 (32%) | 304,305 (33%) | 72,135 (30%) | 103,170 (30%) |  |
| Hospital location/teaching status |  |  |  |  |  |  |  | <0.001 |
| Rural | 228,895 (8.4%) | 16,960 (7.7%) | 38,745 (7.4%) | 38,195 (8.2%) | 88,975 (9.6%) | 17,220 (7.2%) | 28,800 (8.4%) |  |
| Urban, non-teaching | 521,570 (19%) | 43,970 (20%) | 97,470 (19%) | 90,640 (20%) | 178,170 (19%) | 45,405 (19%) | 65,915 (19%) |  |
| Urban, teaching | 1,964,210 (72%) | 160,540 (72%) | 387,170 (74%) | 334,275 (72%) | 658,250 (71%) | 177,825 (74%) | 246,150 (72%) |  |
| Hospital census region |  |  |  |  |  |  |  | <0.001 |
| Midwest | 773,245 (28%) | 61,240 (28%) | 156,910 (30%) | 137,430 (30%) | 272,605 (29%) | 64,755 (27%) | 80,305 (24%) |  |
| Northeast | 487,530 (18%) | 41,585 (19%) | 89,500 (17%) | 79,260 (17%) | 164,900 (18%) | 43,990 (18%) | 68,295 (20%) |  |
| South | 1,018,790 (38%) | 78,775 (36%) | 196,800 (38%) | 173,845 (38%) | 349,565 (38%) | 92,240 (38%) | 127,565 (37%) |  |
| West | 435,110 (16%) | 39,870 (18%) | 80,175 (15%) | 72,575 (16%) | 138,325 (15%) | 39,465 (16%) | 64,700 (19%) |  |
| Cancer | 174,670 (6.4%) | 27,360 (12%) | 30,910 (5.9%) | 22,565 (4.9%) | 36,595 (4.0%) | 22,460 (9.3%) | 34,780 (10%) | <0.001 |
| Coronary artery disease | 1,017,110 (37%) | 77,730 (35%) | 231,395 (44%) | 192,880 (42%) | 308,780 (33%) | 98,005 (41%) | 108,320 (32%) | <0.001 |
| Cerebrovascular disease | 245,765 (9.1%) | 24,785 (11%) | 53,325 (10%) | 38,900 (8.4%) | 62,985 (6.8%) | 27,280 (11%) | 38,490 (11%) | <0.001 |
| Heart failure | 1,504,445 (55%) | 104,220 (47%) | 271,115 (52%) | 258,590 (56%) | 595,790 (64%) | 119,155 (50%) | 155,575 (46%) | <0.001 |
| Chronic kidney disease | 969,520 (36%) | 74,835 (34%) | 186,875 (36%) | 167,510 (36%) | 355,025 (38%) | 87,045 (36%) | 98,230 (29%) | <0.001 |
| Chronic obstructive pulmonary disease | 1,022,510 (38%) | 68,125 (31%) | 173,435 (33%) | 167,510 (36%) | 397,645 (43%) | 74,515 (31%) | 141,280 (41%) | <0.001 |
| Diabetes mellitus | 1,261,520 (46%) | 60,470 (27%) | 249,715 (48%) | 246,815 (53%) | 542,865 (59%) | 96,215 (40%) | 65,440 (19%) | <0.001 |
| Hypertension | 2,341,970 (86%) | 176,150 (80%) | 464,130 (89%) | 415,020 (90%) | 827,120 (89%) | 205,630 (86%) | 253,920 (74%) | <0.001 |
| Hyperlipidemia | 1,499,335 (55%) | 103,215 (47%) | 331,660 (63%) | 287,255 (62%) | 500,865 (54%) | 139,645 (58%) | 136,695 (40%) | <0.001 |
| Liver disease | 177,305 (6.5%) | 15,900 (7.2%) | 32,385 (6.2%) | 28,820 (6.2%) | 63,060 (6.8%) | 17,745 (7.4%) | 19,395 (5.7%) | <0.001 |
| Peripheral vascular disease | 370,290 (14%) | 35,150 (16%) | 79,940 (15%) | 64,100 (14%) | 95,930 (10%) | 37,770 (16%) | 57,400 (17%) | <0.001 |
| Sleep apnea | 758,150 (28%) | 11,785 (5.3%) | 134,215 (26%) | 168,295 (36%) | 401,140 (43%) | 33,035 (14%) | 9,680 (2.8%) | <0.001 |
| Valvular heart disease | 482,535 (18%) | 44,375 (20%) | 106,065 (20%) | 85,750 (19%) | 133,000 (14%) | 49,200 (20%) | 64,145 (19%) | <0.001 |
| Alcohol use | 104,045 (3.8%) | 9,850 (4.4%) | 22,735 (4.3%) | 18,495 (4.0%) | 24,515 (2.6%) | 11,765 (4.9%) | 16,685 (4.9%) | <0.001 |
| Smoking status | 301,510 (11%) | 24,090 (11%) | 58,015 (11%) | 50,390 (11%) | 91,825 (9.9%) | 24,530 (10%) | 52,660 (15%) | <0.001 |

## Outcomes Table:

| **Characteristic** | **Overall**, N = 2,714,675 | **Normal weight (BMI 20.0-24.9kg/m²)**, N = 221,470 | **Class I obesity (BMI 30.0-34.9kg/m²)**, N = 523,385 | **Class II obesity (BMI 35.0-39.9kg/m²)**, N = 463,110 | **Class III obesity (BMI ≥40.0kg/m²)**, N = 925,395 | **Overweight (BMI 25.0-29.9kg/m²)**, N = 240,450 | **Underweight (BMI ≤19.9kg/m²)**, N = 340,865 | **p-value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Died during hospitalization | 127,635 (4.7%) | 16,685 (7.5%) | 15,480 (3.0%) | 12,915 (2.8%) | 37,040 (4.0%) | 12,450 (5.2%) | 33,065 (9.7%) | <0.001 |
| Length of stay (days) | 5.0 (3.0, 8.0) | 6.0 (3.0, 10.0) | 4.0 (2.0, 7.0) | 4.0 (2.0, 7.0) | 5.0 (3.0, 8.0) | 5.0 (3.0, 9.0) | 6.0 (3.0, 9.0) | <0.001 |
| Inflation-adjusted total charge ($) | 48,531 (26,085, 95,770) | 53,328 (29,199, 102,332) | 48,760 (25,664, 98,371) | 46,557 (24,942, 92,047) | 46,356 (25,277, 91,465) | 53,862 (28,325, 106,550) | 50,424 (27,455, 96,636) | <0.001 |

## Multivariable Logistic Regression:

### All-Cause Mortality:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Body mass index |  |  |  |
| Normal weight (BMI 20.0-24.9kg/m²) | — | — |  |
| Class I obesity (BMI 30.0-34.9kg/m²) | 0.55 | 0.52, 0.58 | <0.001 |
| Class II obesity (BMI 35.0-39.9kg/m²) | 0.57 | 0.54, 0.61 | <0.001 |
| Class III obesity (BMI ≥40.0kg/m²) | 0.86 | 0.82, 0.91 | <0.001 |
| Overweight (BMI 25.0-29.9kg/m²) | 0.79 | 0.75, 0.84 | <0.001 |
| Underweight (BMI ≤19.9kg/m²) | 1.35 | 1.29, 1.42 | <0.001 |
| Age, y | 1.02 | 1.02, 1.03 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.16 | 1.13, 1.19 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.32 | 1.22, 1.44 | <0.001 |
| Black | 1.10 | 1.05, 1.15 | <0.001 |
| Hispanic | 1.22 | 1.15, 1.29 | <0.001 |
| Native American | 1.21 | 0.98, 1.49 | 0.080 |
| Other | 1.21 | 1.10, 1.33 | <0.001 |
| Charlson comorbidity index | 1.13 | 1.12, 1.14 | <0.001 |
| Healthcare insurance |  |  |  |
| Private | — | — |  |
| Medicaid | 1.02 | 0.96, 1.09 | 0.5 |
| Medicare | 0.86 | 0.82, 0.90 | <0.001 |
| Other | 1.47 | 1.33, 1.62 | <0.001 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.95 | 0.92, 0.99 | 0.016 |
| $66,000 - $87,999 | 0.89 | 0.85, 0.93 | <0.001 |
| $88,000 or more | 0.91 | 0.87, 0.95 | <0.001 |
| Residential region |  |  |  |
| Large metro | — | — |  |
| Micropolitan | 1.19 | 1.13, 1.26 | <0.001 |
| Small metro | 1.04 | 1.00, 1.08 | 0.064 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.32 | 1.22, 1.44 | <0.001 |
| Urban, teaching | 1.43 | 1.32, 1.54 | <0.001 |
| Hospital census region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.97 | 0.92, 1.03 | 0.3 |
| South | 0.94 | 0.90, 0.98 | 0.008 |
| West | 1.05 | 1.0, 1.10 | 0.080 |
| Cancer |  |  |  |
| No | — | — |  |
| Yes | 1.06 | 1.01, 1.11 | 0.011 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | 0.83 | 0.81, 0.86 | <0.001 |
| Cerebrovascular disease |  |  |  |
| No | — | — |  |
| Yes | 1.21 | 1.15, 1.26 | <0.001 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 1.15 | 1.12, 1.19 | <0.001 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 0.97 | 0.94, 1.00 | 0.093 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 0.95 | 0.93, 0.98 | 0.002 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | 0.84 | 0.82, 0.87 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 0.68 | 0.66, 0.71 | <0.001 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 0.69 | 0.67, 0.71 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 2.54 | 2.44, 2.65 | <0.001 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 0.88 | 0.84, 0.91 | <0.001 |
| Sleep apnea |  |  |  |
| No | — | — |  |
| Yes | 0.60 | 0.58, 0.63 | <0.001 |
| Valvular heart disease |  |  |  |
| No | — | — |  |
| Yes | 0.85 | 0.82, 0.88 | <0.001 |
| Alcohol use |  |  |  |
| No | — | — |  |
| Yes | 0.75 | 0.70, 0.81 | <0.001 |
| Smoking status |  |  |  |
| No | — | — |  |
| Yes | 0.79 | 0.75, 0.83 | <0.001 |

## Multivariable Linear Regression:

### Length of Stay:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Body mass index |  |  |  |
| Normal weight (BMI 20.0-24.9kg/m²) | — | — |  |
| Class I obesity (BMI 30.0-34.9kg/m²) | -1.7 | -1.8, -1.6 | <0.001 |
| Class II obesity (BMI 35.0-39.9kg/m²) | -1.9 | -2.0, -1.8 | <0.001 |
| Class III obesity (BMI ≥40.0kg/m²) | -1.1 | -1.2, -1.0 | <0.001 |
| Overweight (BMI 25.0-29.9kg/m²) | -0.65 | -0.76, -0.54 | <0.001 |
| Underweight (BMI ≤19.9kg/m²) | -0.22 | -0.33, -0.11 | <0.001 |
| Age, y | -0.02 | -0.02, -0.02 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.18 | 0.14, 0.22 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.1 | 0.76, 1.4 | <0.001 |
| Black | 0.48 | 0.40, 0.57 | <0.001 |
| Hispanic | 0.35 | 0.23, 0.47 | <0.001 |
| Native American | -0.03 | -0.39, 0.34 | 0.9 |
| Other | 0.63 | 0.42, 0.85 | <0.001 |
| Charlson comorbidity index | 0.25 | 0.24, 0.27 | <0.001 |
| Healthcare insurance |  |  |  |
| Private | — | — |  |
| Medicaid | 0.65 | 0.53, 0.77 | <0.001 |
| Medicare | 0.13 | 0.05, 0.20 | <0.001 |
| Other | 0.20 | 0.02, 0.38 | 0.031 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | -0.12 | -0.19, -0.06 | <0.001 |
| $66,000 - $87,999 | -0.19 | -0.26, -0.12 | <0.001 |
| $88,000 or more | -0.21 | -0.30, -0.12 | <0.001 |
| Residential region |  |  |  |
| Large metro | — | — |  |
| Micropolitan | 0.30 | 0.19, 0.41 | <0.001 |
| Small metro | -0.14 | -0.22, -0.06 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.93 | 0.79, 1.1 | <0.001 |
| Urban, teaching | 1.7 | 1.6, 1.8 | <0.001 |
| Hospital census region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.24 | 0.09, 0.39 | 0.002 |
| South | 0.23 | 0.11, 0.35 | <0.001 |
| West | -0.27 | -0.40, -0.14 | <0.001 |
| Cancer |  |  |  |
| No | — | — |  |
| Yes | 0.80 | 0.69, 0.91 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | -0.25 | -0.29, -0.20 | <0.001 |
| Cerebrovascular disease |  |  |  |
| No | — | — |  |
| Yes | 0.99 | 0.91, 1.1 | <0.001 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 0.50 | 0.45, 0.54 | <0.001 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 0.17 | 0.10, 0.23 | <0.001 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | -0.09 | -0.14, -0.04 | <0.001 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | -0.09 | -0.14, -0.04 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | -0.55 | -0.62, -0.48 | <0.001 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -0.76 | -0.80, -0.71 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 0.93 | 0.82, 1.0 | <0.001 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | -0.18 | -0.25, -0.11 | <0.001 |
| Sleep apnea |  |  |  |
| No | — | — |  |
| Yes | -0.83 | -0.87, -0.78 | <0.001 |
| Valvular heart disease |  |  |  |
| No | — | — |  |
| Yes | 0.24 | 0.18, 0.29 | <0.001 |
| Alcohol use |  |  |  |
| No | — | — |  |
| Yes | 0.44 | 0.31, 0.57 | <0.001 |
| Smoking status |  |  |  |
| No | — | — |  |
| Yes | -0.51 | -0.58, -0.44 | <0.001 |

### Inflation Adjusted Total Charge:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Body mass index |  |  |  |
| Normal weight (BMI 20.0-24.9kg/m²) | — | — |  |
| Class I obesity (BMI 30.0-34.9kg/m²) | -4,366 | -6,307, -2,425 | <0.001 |
| Class II obesity (BMI 35.0-39.9kg/m²) | -7,746 | -9,812, -5,680 | <0.001 |
| Class III obesity (BMI ≥40.0kg/m²) | -4,838 | -7,155, -2,521 | <0.001 |
| Overweight (BMI 25.0-29.9kg/m²) | 2,381 | 334, 4,429 | 0.023 |
| Underweight (BMI ≤19.9kg/m²) | -848 | -2,905, 1,210 | 0.4 |
| Age, y | -886 | -955, -816 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 7,505 | 6,758, 8,252 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 19,926 | 14,232, 25,621 | <0.001 |
| Black | -347 | -2,233, 1,538 | 0.7 |
| Hispanic | 19,516 | 16,254, 22,779 | <0.001 |
| Native American | -11,706 | -18,156, -5,256 | <0.001 |
| Other | 25,383 | 19,095, 31,671 | <0.001 |
| Charlson comorbidity index | 1,824 | 1,522, 2,127 | <0.001 |
| Healthcare insurance |  |  |  |
| Private | — | — |  |
| Medicaid | -4,472 | -6,806, -2,138 | <0.001 |
| Medicare | -1,670 | -3,070, -271 | 0.019 |
| Other | 1,098 | -2,519, 4,715 | 0.6 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | -314 | -1,675, 1,047 | 0.7 |
| $66,000 - $87,999 | -2,823 | -4,463, -1,183 | <0.001 |
| $88,000 or more | -227 | -2,738, 2,284 | 0.9 |
| Residential region |  |  |  |
| Large metro | — | — |  |
| Micropolitan | 1,556 | -1,075, 4,187 | 0.2 |
| Small metro | -9,681 | -11,994, -7,368 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 30,410 | 27,442, 33,379 | <0.001 |
| Urban, teaching | 43,830 | 41,039, 46,622 | <0.001 |
| Hospital census region |  |  |  |
| Midwest | — | — |  |
| Northeast | 11,316 | 7,229, 15,403 | <0.001 |
| South | 15,311 | 12,542, 18,081 | <0.001 |
| West | 41,922 | 37,392, 46,451 | <0.001 |
| Cancer |  |  |  |
| No | — | — |  |
| Yes | 14,435 | 12,435, 16,436 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | 7,347 | 6,514, 8,180 | <0.001 |
| Cerebrovascular disease |  |  |  |
| No | — | — |  |
| Yes | 15,057 | 13,514, 16,599 | <0.001 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 1,346 | 423, 2,269 | 0.004 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | -1,702 | -2,816, -589 | 0.003 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | -2,704 | -3,545, -1,864 | <0.001 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | -1,893 | -2,784, -1,003 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | -8,356 | -9,673, -7,039 | <0.001 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -5,456 | -6,313, -4,600 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 21,222 | 18,914, 23,530 | <0.001 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 2,773 | 1,293, 4,254 | <0.001 |
| Sleep apnea |  |  |  |
| No | — | — |  |
| Yes | -11,691 | -12,608, -10,774 | <0.001 |
| Valvular heart disease |  |  |  |
| No | — | — |  |
| Yes | 15,003 | 13,725, 16,282 | <0.001 |
| Alcohol use |  |  |  |
| No | — | — |  |
| Yes | -8,389 | -10,529, -6,249 | <0.001 |
| Smoking status |  |  |  |
| No | — | — |  |
| Yes | -6,981 | -8,249, -5,713 | <0.001 |