**SUPPLEMENTAL DIGITAL CONTENT**

for

**Racial/Ethnic Differences in 30-day Mortality for Heart Failure and Pneumonia in the Veterans Health Administration using Claims-Based, Clinical, and Social Risk-Adjustment Variables**

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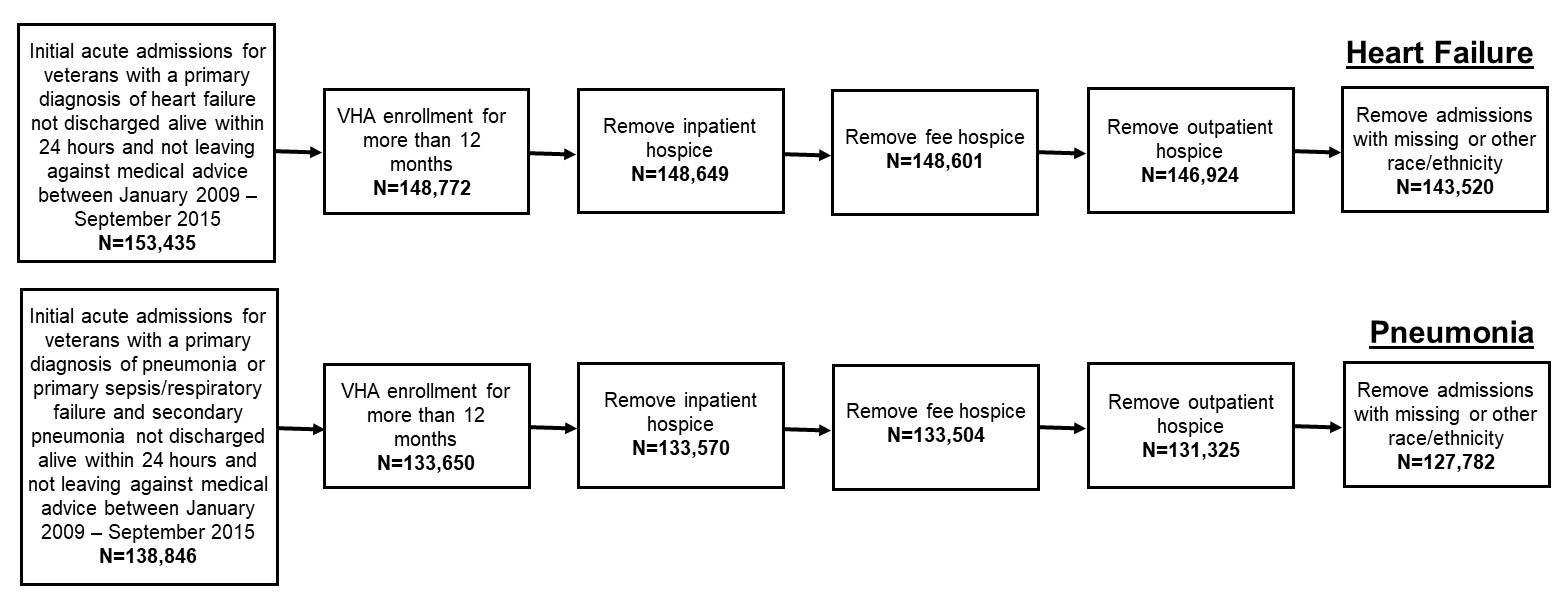
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**Supplemental Digital Content 1, Table. ICD-9 Codes for Primary Diagnoses**

|  |  |
| --- | --- |
| **Primary Diagnoses** | **ICD-9 Codes/Descriptions** |
| *Heart Failure* | 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, and 428.9 |
| *Pneumonia* | 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.42, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 485, 486, 487.0, and 488.11 |
| *Sepsis or RF [with secondary diagnosis of pneumonia]* | |  |  | | --- | --- | | 38 | STREPTOCOCCAL SEPTICEMIA | | 38.1 | STAPHYLOCOCCAL SEPTICEMIA | | 38.1 | STAPHYLOCOCCAL SEPTICEMIA, UNSPECIFIED | | 38.11 | STAPHYLOCOCCUS AUREUS SEPTICEMIA | | 38.11 | METHICILLIN SUSCEPTIBLE STAPHYLOCOCCUS AUREUS SEPTICEMIA | | 38.12 | METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS SEPTICEMIA | | 38.19 | OTHER STAPHYLOCOCCAL SEPTICEMIA | | 38.2 | PNEUMOCOCCAL SEPTICEMIA | | 38.3 | SEPTICEMIA DUE TO ANAEROBES | | 38.4 | SEPTICEMIA DUE TO GRAM-NEGATIVE ORGANISM, UNSPECIFIED | | 38.41 | SEPTICEMIA DUE TO HEMOPHILUS INFLUENZAE (H. INFLUENZAE) | | 38.42 | SEPTICEMIA DUE TO ESCHERICHIA COLI (E. COLI) | | 38.43 | SEPTICEMIA DUE TO PSEUDOMONAS | | 38.44 | SEPTICEMIA DUE TO SERRATIA | | 38.49 | OTHER SEPTICEMIA DUE TO GRAM-NEGATIVE ORGANISMS | | 38.8 | OTHER SPECIFIED SEPTICEMIAS | | 38.9 | UNSPECIFIED SEPTICEMIA | | 518.81 | ACUTE RESPIRATORY FAILURE | | 518.82 | OTHER PULMONARY INSUFFICIENCY, NEC | | 518.84 | ACUTE AND CHRONIC RESPIRATORY FAILURE | | 785.52 | SEPTIC SHOCK | | 799.1 | RESPIRATORY ARREST | | 995.91 | SEPSIS | | 995.92 | SEVERE SEPSIS | |

**Supplemental Digital Content 2, Figure. Exclusion Flowchart for the Study Population**

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**Supplemental Digital Content 3, Table. Summary of Missing Data for Clinical Variables and Area Deprivation Index, by Race/Ethnicity, for Heart Failure**

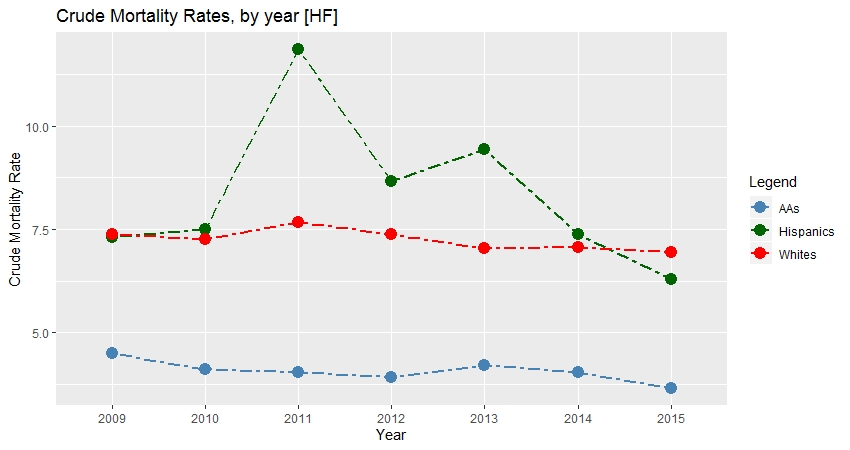
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Heart Failure (n=143,520)** | | | | | |
| **White (n=101,226)** | | **Black (n=38,044)** | | **Hispanic (n=4,250)** | |
| **Number Missing** | **%** | **Number Missing** | **%** | **Number Missing** | **%** |
| Systolic Blood Pressure | 2,193 | 2.17 | 765 | 2.01 | 82 | 1.93 |
| Diastolic Blood Pressure | 947 | 0.94 | 316 | 0.83 | 37 | 0.87 |
| Heart Rate | 55 | 0.05 | 8 | 0.02 | 2 | 0.04 |
| Respiratory Rate | 833 | 0.82 | 258 | 0.68 | 30 | 0.71 |
| Blood Urea Nitrogen | 5,880 | 5.81 | 2,474 | 6.50 | 319 | 7.51 |
| Oxygen Saturation | 582 | 0.57 | 184 | 0.48 | 21 | 0.49 |
| Creatinine | 815 | 0.81 | 516 | 1.36 | 127 | 2.99 |
| Potassium | 3,275 | 3.24 | 1,603 | 4.21 | 238 | 5.60 |
| Hematocrit | 4,991 | 4.93 | 984 | 2.59 | 76 | 1.79 |
| B-type Natriuretic Peptide | 12,557 | 12.40 | 5,006 | 13.16 | 629 | 14.8 |
| Body Mass Index | 15,225 | 15.04 | 5,690 | 14.96 | 585 | 13.76 |
| Left- Ventricular Ejection Fraction | 34,950 | 34.53 | 11,160 | 29.33 | 1,784 | 41.98 |
| Sodium | 2,776 | 2.74 | 1,426 | 3.75 | 233 | 5.48 |
| Area Deprivation Index | 1,048 | 1.04 | 267 | 0.70 | 388 | 9.13 |

**Supplemental Digital Content 4, Table. Summary of Missing Data for Clinical Variables and Area Deprivation Index, by Race/Ethnicity, for Pneumonia**

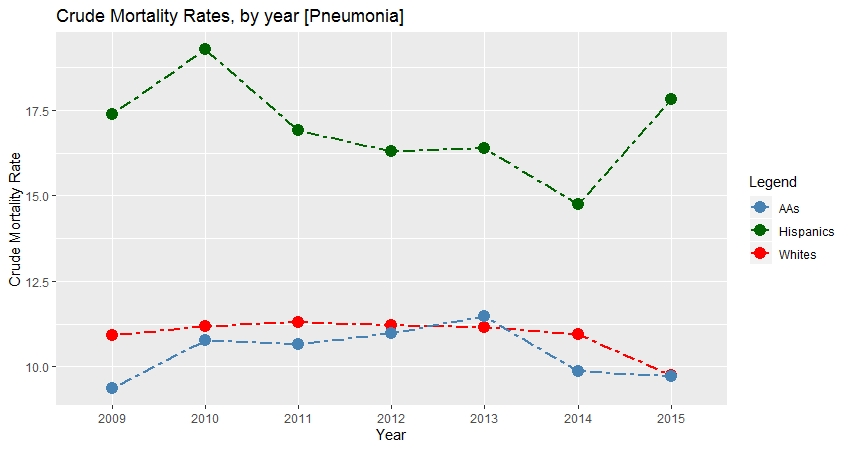
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Pneumonia (n=127,782)** | | | | | |
| **White (n=101,868)** | | **Black (n=19,590)** | | **Hispanic (n=6,324)** | |
| **Number Missing** | **%** | **Number Missing** | **%** | **Number Missing** | **%** |
| Systolic Blood Pressure | 1,910 | 1.87 | 365 | 1.86 | 89 | 1.41 |
| Diastolic Blood Pressure | 239 | 0.23 | 44 | 0.22 | 10 | 0.16 |
| Heart Rate | 20 | 0.02 | 3 | 0.02 | 0 | 0.00 |
| Respiratory Rate | 33 | 0.03 | 9 | 0.05 | 0 | 0.00 |
| Blood Urea Nitrogen | 5,789 | 5.68 | 1,315 | 6.71 | 373 | 5.90 |
| Oxygen Saturation | 24 | 0.02 | 7 | 0.04 | 0 | 0.00 |
| Creatinine | 725 | 0.71 | 218 | 1.11 | 79 | 1.25 |
| Potassium | 3,121 | 3.06 | 718 | 3.67 | 215 | 3.40 |
| Hematocrit | 4,957 | 4.87 | 598 | 3.05 | 78 | 1.23 |
| Body Mass Index | 8,970 | 8.81 | 1,622 | 8.28 | 367 | 5.80 |
| Sodium | 2,645 | 2.60 | 628 | 3.21 | 215 | 3.40 |
| Serum Glucose | 3,608 | 3.54 | 888 | 4.53 | 269 | 4.25 |
| Area Deprivation Index | 1,150 | 1.13 | 139 | 0.71 | 689 | 10.90 |

**Supplemental Digital Content 5, Figure. Unadjusted Mortality Rates by Year for HF and Pneumonia**

1. **Heart Failure**

****

1. **Pneumonia**

****

Unadjusted mortality rates for 2015 only include data for three quarters due to end of study period; all other years include data for four quarters

**Supplemental Digital Content 6, Table. Average Marginal Effects (95% CI) [Cohort excluding Veterans hospitalized in VAMC outside continental US] -> Percent chance of mortality for Black and Hispanic Veterans relative to White Veterans**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Heart Failure (n=141,109)** | | **Pneumonia (n=124,400)** | |
| **Black (n=37,878)** | **Hispanic (n=2,915)** | **Black (n=19,515)** | **Hispanic (n=3,680)** |
| Base | -2.11  (-2.38, -1.83) | -0.83  (-1.70, 0.06) | 0.98  (0.47, 1.49) | 0.63  (-0.41, 1.68) |
| Claims-Based | -2.15  (-2.43, -1.86) | -0.45  (-1.37, 0.48) | 0.07  (-0.42, 0.57) | 0.27  (-0.75, 1.29) |
| Clinical | -1.55  (-1.84, -1.25) | -0.33  (-1.22, 0.56) | -0.52  (-0.99, -0.05) | 0.65  (-0.38, 1.68) |
| Claims-Based + Clinical | -1.54  (-1.84, -1.24) | -0.20  (-1.10, 0.71) | -0.83  (-1.30, -0.36) | 0.23  (-0.77, 1.22) |
| Claims-Based + Clinical  + Sociodemographic | -1.62  (-1.92, -1.32) | -0.22  (-1.12, 0.68) | -0.99  (-1.46, -0.52) | 0.33  (-0.67, 1.33) |
| Claims-Based + Clinical + VA Hospital | -1.31  (-1.64, -0.97) | -0.02  (-0.96, 0.92) | -0.96  (-1.46, -0.46) | 0.23  (-0.81, 1.27) |

All models adjusted for Quarter, Age, Sex

**Supplemental Digital Content 7, Table. Average Marginal Effects (95% CI), stratified by ejection fraction -> Percent chance of mortality for Black and Hispanic Veterans relative to White Veterans**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Ejection Fraction <40**  **(n=51,579)** | | **Ejection Fraction ≥40**  **(n=44,047)** | | **Unknown Ejection Fraction (n=47,894)** | |
| **Black (n=17,246)** | **Hispanic (n=1,292)** | **Black**  **(n=9,638)** | **Hispanic (n=1,174)** | **Black (n=11,160)** | **Hispanic (n=1,784)** |
| Base | -2.60  (-3.05, -2.16) | -0.86  (-2.19, 0.47) | -1.18  (-1.63, -0.74) | 0.66  (-0.63, 1.95) | -2.74  (-3.30, -2.18) | 1.87  (0.49, 3.25) |
| Claims-Based | -2.59  (-3.05, -2.13) | -0.12  (-1.57, 1.33) | -1.12  (-1.58, -0.66) | 1.09  (-0.29, 2.47) | -2.87  (-3.43, -2.30) | 1.88  (0.48, 3.27) |
| Clinical | -1.72  (-2.18, -1.25) | 0.29  (-1.11, 1.70) | -0.32  (-0.83, 0.19) | 0.80  (-0.44, 2.05) | -1.85  (-2.44, -1.25) | 2.06  (0.75, 3.38) |
| Claims-Based + Clinical | -1.62  (-2.10, -1.14) | 0.65  (-0.81, 2.11) | -0.29  (-0.81, 0.23) | 1.08  (-0.23, 2.39) | -1.89  (-2.49, -1.29) | 1.89  (0.58, 3.20) |
| Claims-Based + Clinical  + Sociodemographic | -1.71  (-2.19, -1.22) | 0.63  (-0.83, 2.09) | -0.37  (-0.89, 0.15) | 1.30  (-0.05, 2.65) | -1.94  (-2.54, -1.35) | 2.27  (0.92, 3.62) |
| Claims-Based + Clinical + VA Hospital | -1.18  (-1.72, -0.64) | 0.24  (-1.25, 1.74) | -0.39  (-0.95, 0.17) | 0.05  (-1.19, 1.30) | -1.80  (-2.45, -1.15) | 1.23  (-0.32, 2.77) |

All models adjusted for Quarter, Age, Sex

Clinical variables do not include ejection fraction for this analysis

**Supplemental Digital Content 8, Table. Average Marginal Effects (95% CI) [One Random Admission Per Veteran] -> Percent chance of mortality for Black and Hispanic Veterans relative to White Veterans**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Full Cohort** | | | | **Cohort excluding Veterans hospitalized in VAMC outside continental US** | | | |
| **Heart Failure (n=82,763)** | | **Pneumonia (n=102,646)** | | **Heart Failure (n=81,378)** | | **Pneumonia (n=99,883)** | |
| **Black (n=18,743)** | **Hispanic (n=3,343)** | **Black (n=16,397)** | **Hispanic (n=5,768)** | **Black (n=18,694)** | **Hispanic (n=2,277)** | **Black (n=16,357)** | **Hispanic (n=3,368)** |
| Base | -1.85  (-2.28, -1.43) | 0.86  (-0.08, 1.81) | 0.73  (0.16, 1.31) | 4.89  (3.94, 5.84) | -1.86  (-2.28, -1.44) | -1.11  (-2.16, -0.05) | 0.72  (0.15, 1.29) | 0.10  (-1.01, 1.22) |
| Claims-Based | -1.87  (-2.30, -1.44) | 1.04  (0.08, 2.00) | -0.12  (-0.68, 0.44) | 4.39  (3.46, 5.32) | -1.88  (-2.31, -1.45) | -0.90  (-1.97, 0.18) | -0.12  (-0.67, 0.44) | -0.18  (-1.27, 0.91) |
| Clinical | -1.06  (-1.51, -0.60) | 1.05  (0.15, 1.96) | -0.85  (-1.39, -0.32) | 3.33  (2.46, 4.20) | -1.07  (-1.53, -0.62) | -0.95  (-1.96, 0.06) | -0.84  (-1.37, -0.31) | 0.04  (-1.04, 1.12) |
| Claims-Based + Clinical | -1.06  (-1.52, -0.59) | 1.14  (0.23, 2.06) | -1.07  (-1.61, -0.53) | 3.09  (2.22, 3.95) | -1.07  (-1.53, -0.60) | -0.78  (-1.81, 0.25) | -1.05  (-1.58, -0.51) | -0.24  (-1.30, 0.83) |
| Claims-Based + Clinical + Sociodemographic | -1.21  (-1.68, -0.75) | 1.31  (0.37, 2.24) | -1.24  (-1.77, -0.70) | 3.63  (2.75, 4.52) | -1.21  (-1.67, -0.75) | -0.78  (-1.82, 0.25) | -1.19  (-1.72, -0.66) | -0.10  (-1.17, 0.96) |
| Claims-Based + Clinical + VA Hospital | -0.88  (-1.38, -0.37) | 0.07  (-0.97, 1.10) | -1.13  (-1.71, -0.55) | 0.26  (-0.79, 1.32) | -0.89  (-1.39, -0.39) | -0.68  (-1.75, 0.40) | -1.12  (-1.69, -0.55) | -0.34  (-1.44, 0.77) |
| All models adjusted for Quarter, Age and Sex | | | | | | | | |