**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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**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 |

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**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**

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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 |