**Supplemental Table 1. Codes Used to Identify Heart Failure and Comorbidities, Nationwide Emergency Department Sample, National (Nationwide) Inpatient Sample and National Vital Statistics System, 2006-2014**

|  |  |  |
| --- | --- | --- |
| Outcome | ICD9-CM or CCS codes for NIS and NEDS | ICD 10 for NVSS |
| Heart failure | 428, 402.01, 402.11, 402.91, 404.11, 404.13, 404.91, 404.93 | I50, I11.0, I13.0, I13.2 |
| Asthma | CCS=128 | J45, J46 |
| Atrial fibrillation/flutter | ICD9=427.3 | I48 |
| Chronic kidney disease (CKD) | CCS=158 | N18, Y84.1 |
| Chronic obstructive pulmonary disease (COPD) | CCS=127 | J40, J41, J42, J43, J44, J47 |
| Depression | ICD 9 in (296, 298.0, 311, 301.12) | F32, F33, F34.1 |
| Dementia or Alzheimer’s | CCS=653 | F01, F03, F04, F05, F07, F09, G30, G31, R54 |
| Diabetes | CCS in (49,50) | E10-E14, R73.0, R73.9, R81, R82.4, Y42.3 |
| Hypertension | CCS in (98,99) and excluded ICD 9 in (402.01, 402.11, 402.91, 404.11, 404.13, 404.91, 404.93) | I10, I11.9, I12, I13.1, I13.9, I15.0, I15.9, I67.4 |
| Ischemic heart disease | CCS in (100, 101) | I20, I21, I22, I24, I25 |
| Pneumonia | CCS=122 | A20.2, A21.2, A22.1, A31.0, A43.0, A48.1, B01.2, B05.2, B25.0, B37.1, B38, B39, B58.3, B59, J12, J13, J14, J15, J16.0, J16.8, J18, J85.1, J11.0 |
| Cerebrovascular disease (stroke) | CCS=109 | I60-I64, I69 |

**Supplemental Table 2: Trends in total unique acute heart failure events, by age category and primary or comorbid heart failure, Nationwide Emergency Department Sample, National (Nationwide) Inpatient Sample and National Vital Statistics System, 2006-2014\***

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Primary Heart Failure Events** | **Comorbid Heart Failure Events** | **Primary or Comorbid HF Events** |
| **N** | **Rate per 100,000** | **N** | **Rate per 100,000** | **N** | **Rate per 100,000** |
| **2006\*** | 1188402 | 536 | 3253562 | 1467 | 4441964 | 2003 |
|  Men18-44 years | 33950 | 59 | 66747 | 117 | 100696 | 176 |
|  Men 45-64 years | 157168 | 433 | 351849 | 969 | 509016 | 1402 |
|  Men 65-74 years | 121014 | 1384 | 311037 | 3558 | 432051 | 4942 |
|  Men 75+ years | 251829 | 3593 | 690645 | 9853 | 942474 | 13446 |
|  Women 18-44 years | 21277 | 38 | 69425 | 125 | 90702 | 163 |
|  Women 45-64 years | 111296 | 292 | 335863 | 880 | 447159 | 1171 |
|  Women 65-74 years | 111495 | 1089 | 334597 | 3267 | 446092 | 4355 |
|  Women 75+ years | 380374 | 3384 | 1093400 | 9727 | 1473774 | 13110 |
| **2007\*** | 1120030 | 497 | 3229841 | 1433 | 4349871 | 1930 |
|  Men18-44 years | 33117 | 58 | 64782 | 113 | 97899 | 171 |
|  Men 45-64 years | 151611 | 408 | 362019 | 974 | 513631 | 1382 |
|  Men 65-74 years | 115238 | 1284 | 310204 | 3456 | 425443 | 4740 |
|  Men 75+ years | 236904 | 3316 | 679243 | 9508 | 916147 | 12824 |
|  Women 18-44 years | 19988 | 36 | 69693 | 125 | 89681 | 161 |
|  Women 45-64 years | 107418 | 275 | 344012 | 881 | 451430 | 1156 |
|  Women 65-74 years | 102389 | 978 | 330744 | 3159 | 433133 | 4137 |
|  Women 75+ years | 353363 | 3118 | 1069145 | 9433 | 1422507 | 12551 |
| **2008\*** | 1131985 | 493 | 3341419 | 1456 | 4473405 | 1949 |
|  Men18-44 years | 30418 | 53 | 66287 | 115 | 96705 | 168 |
|  Men 45-64 years | 149573 | 395 | 375702 | 993 | 525275 | 1388 |
|  Men 65-74 years | 115677 | 1237 | 325595 | 3483 | 441272 | 4720 |
|  Men 75+ years | 250753 | 3450 | 705121 | 9701 | 955874 | 13151 |
|  Women 18-44 years | 18228 | 33 | 72368 | 130 | 90595 | 163 |
|  Women 45-64 years | 103856 | 261 | 354595 | 892 | 458450 | 1153 |
|  Women 65-74 years | 102988 | 949 | 338800 | 3122 | 441789 | 4070 |
|  Women 75+ years | 360494 | 3159 | 1102950 | 9666 | 1463443 | 12825 |
| **2009\*** | 1156793 | 496 | 3496098 | 1501 | 4652891 | 1997 |
|  Men18-44 years | 30389 | 53 | 73378 | 127 | 103767 | 180 |
|  Men 45-64 years | 158240 | 410 | 417124 | 1082 | 575364 | 1492 |
|  Men 65-74 years | 121687 | 1258 | 350661 | 3624 | 472348 | 4881 |
|  Men 75+ years | 254546 | 3449 | 724868 | 9820 | 979413 | 13269 |
|  Women 18-44 years | 18312 | 33 | 77966 | 140 | 96278 | 173 |
|  Women 45-64 years | 106878 | 264 | 390492 | 964 | 497370 | 1227 |
|  Women 65-74 years | 105208 | 940 | 357400 | 3193 | 462608 | 4133 |
|  Women 75+ years | 361532 | 3152 | 1104211 | 9626 | 1465743 | 12777 |
| **2010\*** | 1108281 | 468 | 3586868 | 1515 | 4695149 | 1983 |
|  Men18-44 years | 30376 | 53 | 77959 | 135 | 108334 | 187 |
|  Men 45-64 years | 156909 | 400 | 444473 | 1133 | 601382 | 1533 |
|  Men 65-74 years | 114647 | 1152 | 355023 | 3566 | 469669 | 4717 |
|  Men 75+ years | 243517 | 3234 | 732916 | 9733 | 976433 | 12967 |
|  Women 18-44 years | 18496 | 33 | 87555 | 157 | 106051 | 190 |
|  Women 45-64 years | 102599 | 249 | 412270 | 1001 | 514869 | 1250 |
|  Women 65-74 years | 97712 | 851 | 362920 | 3162 | 460632 | 4014 |
|  Women 75+ years | 344025 | 2972 | 1113753 | 9622 | 1457778 | 12594 |
| **2011\*** | 1117249 | 467 | 3912362 | 1635 | 5029611 | 2102 |
|  Men18-44 years | 28427 | 50 | 83222 | 146 | 111649 | 195 |
|  Men 45-64 years | 151604 | 375 | 487372 | 1207 | 638976 | 1582 |
|  Men 65-74 years | 116626 | 1113 | 392212 | 3743 | 508838 | 4856 |
|  Men 75+ years | 247361 | 3317 | 801931 | 10755 | 1049292 | 14072 |
|  Women 18-44 years | 17831 | 32 | 90840 | 161 | 108671 | 193 |
|  Women 45-64 years | 102456 | 242 | 451232 | 1064 | 553687 | 1305 |
|  Women 65-74 years | 99745 | 831 | 399993 | 3331 | 499738 | 4161 |
|  Women 75+ years | 353200 | 3092 | 1205560 | 10552 | 1558760 | 13644 |
| **2012\*** | 1052497 | 431 | 3901854 | 1597 | 4954351 | 2028 |
|  Men18-44 years | 27883 | 48 | 86713 | 151 | 114595 | 199 |
|  Men 45-64 years | 146283 | 362 | 506090 | 1253 | 652372 | 1615 |
|  Men 65-74 years | 112572 | 1004 | 405696 | 3619 | 518268 | 4623 |
|  Men 75+ years | 233685 | 3070 | 790625 | 10386 | 1024310 | 13456 |
|  Women 18-44 years | 16433 | 29 | 90712 | 160 | 107145 | 189 |
|  Women 45-64 years | 95258 | 224 | 453865 | 1069 | 549123 | 1294 |
|  Women 65-74 years | 96271 | 753 | 409367 | 3201 | 505638 | 3954 |
|  Women 75+ years | 324112 | 2810 | 1158788 | 10048 | 1482900 | 12858 |
| **2013\*** | 1087436 | 437 | 4072870 | 1635 | 5160306 | 2071 |
|  Men18-44 years | 29051 | 50 | 93795 | 162 | 122846 | 212 |
|  Men 45-64 years | 156313 | 386 | 546344 | 1348 | 702657 | 1734 |
|  Men 65-74 years | 120540 | 1022 | 438948 | 3721 | 559488 | 4742 |
|  Men 75+ years | 241298 | 3093 | 816835 | 10469 | 1058133 | 13562 |
|  Women 18-44 years | 16696 | 29 | 97824 | 172 | 114521 | 202 |
|  Women 45-64 years | 101176 | 238 | 478846 | 1125 | 580021 | 1363 |
|  Women 65-74 years | 100279 | 747 | 432697 | 3225 | 532976 | 3972 |
|  Women 75+ years | 322083 | 2756 | 1167582 | 9992 | 1489664 | 12749 |
| **2014\*** | 1140891 | 449 | 4289755 | 1689 | 5430646 | 2138 |
|  Men18-44 years | 31309 | 54 | 101902 | 175 | 133211 | 229 |
|  Men 45-64 years | 169487 | 416 | 606490 | 1488 | 775976 | 1904 |
|  Men 65-74 years | 129470 | 1048 | 473467 | 3834 | 602936 | 4883 |
|  Men 75+ years | 249372 | 3116 | 838126 | 10474 | 1087498 | 13590 |
|  Women 18-44 years | 18737 | 33 | 110566 | 193 | 129303 | 226 |
|  Women 45-64 years | 107147 | 250 | 526687 | 1231 | 633834 | 1481 |
|  Women 65-74 years | 106004 | 755 | 460804 | 3280 | 566808 | 4034 |
|  Women 75+ years | 329366 | 2781 | 1171714 | 9894 | 1501079 | 12675 |

\* Standardized by age to the 2010 U.S. Census Population distribution among adults aged ≥18 years; The crude age-sex specific rates were reported for sub group estimates; To be consistent with the earlier years, only 24 secondary codes in NIS and NEDS were included for the trend analyses.

**Supplemental Table 3: Trends in primary heart failure events, Nationwide Emergency Department Sample, National (Nationwide) Inpatient Sample and National Vital Statistics System, 2006-2014\***

|  |  |
| --- | --- |
|  | **Heart Failure as Primary Diagnosis** |
| **Unique Emergency Department Visits** | **Unique****Acute Hospitalizations** | **Unique****Deaths** | **Total Events****(unique)** |
| **N** | **Rate per 100,000** | **N** | **Rate per 100,000** | **N** | **Rate per 100,000** | **N** | **Rate per 100,000** |
| **2006\*** | 171592 | 78 | 944298 | 427 | 72512 | 32 | 1188402 | 536 |
| **2007\*** | 155036 | 69 | 895985 | 398 | 69009 | 30 | 1120030 | 497 |
| **2008\*** | 157910 | 69 | 904578 | 394 | 69498 | 30 | 1131985 | 493 |
| **2009\*** | 157206 | 68 | 930635 | 400 | 68951 | 29 | 1156793 | 496 |
| **2010\*** | 150880 | 64 | 886879 | 375 | 70522 | 29 | 1108281 | 468 |
| **2011\*** | 150600 | 63 | 895220 | 374 | 71429 | 30 | 1117249 | 467 |
| **2012\*** | 155993 | 64 | 822425 | 337 | 74079 | 30 | 1052497 | 431 |
| **2013\*** | 172908 | 70 | 835084 | 335 | 79443 | 32 | 1087436 | 437 |
| **2014\*** | 190310 | 75 | 866875 | 341 | 83705 | 33 | 1140891 | 449 |
| **RPC£ (95%CI)** | -3.2% (-3.5, -3.0%) | -20.1% (-21.6, -18.5%) | 3.36% (3.30, 3.41%) | -16.2% (-17.4, -15.0%) |

\* Standardized by age to the 2010 U.S. Census Population distribution among adults aged ≥18 years.

**£** Relative Percent Change (RPC) for a given rate is calculated with the following: (rate2014 – rate2006)/ rate2006.

**Supplemental Table 4 Trends in comorbid heart failure events, Nationwide Emergency Department Sample, National (Nationwide) Inpatient Sample and National Vital Statistics System, 2006-2014\***

|  |  |
| --- | --- |
|  | **HF as Comorbid Diagnosis** |
| **Unique****Emergency Department Visits** | **Unique****Acute Hospitalizations** | **Unique****Deaths** | **Total Events****(unique)** |
| **N** | **Rate per 100,000** | **N** | **Rate per 100,000** | **N** | **Rate per 100,000** | **N** | **Rate per 100,000** |
| **2006\*** | 680544 | 308 | 2358160 | 1064 | 214858 | 95 | 3253562 | 1467 |
| **2007\*** | 723016 | 322 | 2293958 | 1018 | 212867 | 93 | 3229841 | 1433 |
| **2008\*** | 811669 | 355 | 2312966 | 1008 | 216784 | 93 | 3341419 | 1456 |
| **2009\*** | 868249 | 374 | 2417284 | 1038 | 210565 | 89 | 3496098 | 1501 |
| **2010\*** | 948553 | 402 | 2424642 | 1024 | 213673 | 89 | 3586868 | 1515 |
| **2011\*** | 1049960 | 439 | 2644652 | 1105 | 217750 | 91 | 3912362 | 1635 |
| **2012\*** | 1086246 | 446 | 2598720 | 1062 | 216888 | 89 | 3901854 | 1597 |
| **2013\*** | 1212506 | 489 | 2634464 | 1055 | 225900 | 91 | 4072870 | 1635 |
| **2014\*** | 1350516 | 535 | 2708276 | 1063 | 230963 | 91 | 4289755 | 1689 |
| **RPC£ (95%CI)** | 73.9% (73.6, 74.2%) | -0.1% (-2.0, 1.8%) | -4.59% (-4.61, -4.58%) | 15.1% (14.1, 16.2%) |

\* Standardized by age to the 2010 U.S. Census Population distribution among adults aged ≥18 years; To be consistent with the earlier years, only 24 secondary codes in NIS and NEDS were included for the trend analyses.

**£** Relative Percent Change (RPC) for a given rate is calculated with the following: (rate2014 – rate2006)/ rate2006.

**Supplemental Table 5 Trends in combined primary or comorbid heart failure events, Nationwide Emergency Department Sample, National (Nationwide) Inpatient Sample and National Vital Statistics System, 2006-2014\***

|  |  |
| --- | --- |
|  | **Heart Failure as Primary or Comorbid Diagnosis** |
| **Unique****Emergency Department Visits** | **Unique****Acute Hospitalizations** | **Unique****Deaths** | **Total Events****(unique)** |
| **N** | **Rate per 100,000** | **N** | **Rate per 100,000** | **N** | **Rate per 100,000** | **N** | **Rate per 100,000** |
| **2006\*** | 852136 | 385 | 3302458 | 1491 | 287370 | 127 | 4441964 | 2003 |
| **2007\*** | 878052 | 391 | 3189943 | 1416 | 281876 | 123 | 4349871 | 1930 |
| **2008\*** | 969579 | 424 | 3217544 | 1402 | 286282 | 123 | 4473405 | 1949 |
| **2009\*** | 1025456 | 441 | 3347920 | 1437 | 279516 | 119 | 4652891 | 1997 |
| **2010\*** | 1099433 | 466 | 3311521 | 1398 | 284195 | 119 | 4695149 | 1983 |
| **2011\*** | 1200560 | 502 | 3539872 | 1479 | 289179 | 121 | 5029611 | 2102 |
| **2012\*** | 1242239 | 510 | 3421145 | 1399 | 290967 | 119 | 4954351 | 2028 |
| **2013\*** | 1385415 | 558 | 3469548 | 1391 | 305343 | 123 | 5160306 | 2071 |
| **2014\*** | 1540826 | 610 | 3575152 | 1404 | 314668 | 124 | 5430646 | 2138 |
| **RPC£ (95%CI)** | 58.4% (57.7, 59.0%) | -5.8% (-7.1, -4.5%) | -2.59% (-2.61, -2.58%) | 6.7% (6.0, 7.5%) |

\* Standardized by age to the 2010 U.S. Census Population distribution among adults aged ≥18 years; To be consistent with the earlier years, only 24 secondary codes in NIS and NEDS were included for the trend analyses.

**£** Relative Percent Change (RPC) for a given rate is calculated with the following: (rate2014 – rate2006)/ rate2006.

**Supplemental Figure 1. Trends in total unique acute heart failure event rates, by age group, for combined primary plus comorbid HF – Nationwide Emergency Department Sample, National (Nationwide) Inpatient Sample and National Vital Statistics System, 2006-2014**

Rate per 100,000 persons

Totals standardized by age to the 2010 U.S. Census Population distribution among adults aged ≥18 years. Crude age-sex specific rates were reported for sub group estimates. Includes combination of emergency department visits, acute hospitalizations, and deaths. HF=heart failure. See Supplemental Table 4 for detailed numeric results.