ORIGINAL RESEARCH

Demographic, Regional, and State-Level Trends of Mortality in Patients With Aortic Stenosis in United States, 2008 to 2018

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BACKGROUND: Aortic stenosis–related mortality might vary across demographic subsets, regions, and states in the United States.

METHODS AND RESULTS: We reviewed the death certificate data from the Centers for Disease Control and Prevention Wide-Ranging OnLine Data for Epidemiologic Research database to examine aortic stenosis–related mortality trends from 2008 to 2018. Crude and age-adjusted mortality rates (AAMRs) per 100,000 people and annual percentage change with 95% CIs were calculated. Between 2008 and 2018, AAMR reduced from 12.7 to 11.5 (average annual percentage change, −1.0 [95% CI, −1.5 to −0.5]), because of an accelerated decline between 2015 and 2018 (annual percentage change, −4.4 [95% CI, −6.0 to −2.7]). Older (aged >85 years), male, and White patients had higher death rates than younger, female, and non-White patients, respectively. Although mortality reduction was similar across sexes, significant mortality reduction was limited to White patients only. The AAMRs were higher in rural than urban areas. States with AAMRs >90th percentile were distributed in the West and the Northeast, and <10th percentile in the South. The AAMRs for sex and race were highest in the West and lowest in the South. None of the states located in the Midwest showed a significant reduction in mortality. Mortality remained stable for hospital setting and nursing home/long-term care facility, except that the number of deaths increased at home and hospice facility since 2014.

CONCLUSIONS: The reduction in mortality in patients with aortic stenosis was not consistent among demographic subsets and states. The substantial public health and economic implications call for determination of underlying clinical and socioeconomic factors to narrow the gap.

Key Words: aortic stenosis ■ epidemiology ■ mortality

Aortic stenosis (AS) is one of the most common valvular problems associated with significant morbidity and mortality in the United States. Before transcatheter aortic valve replacement (TAVR) therapy, surgical aortic valve replacement (AVR) was considered the gold standard to improve the prognosis. Consequently, a significant proportion of elderly patients with significant multimorbidity burden were left untreated. There has been a significant improvement in life expectancy in older patients after TAVR. However, the survival benefit does not appear to be similar in non-White compared with White patients. Moreover, geographical variations in the use of TAVR have demonstrated contrasting patterns of in-hospital mortality in the US regions.

Prior data through 2017 suggested that AS-related mortality did not improve in nonmetropolitan populations. In view of striking regional socioeconomic
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**CLINICAL PERSPECTIVE**

**What Is New?**
- Between 2008 and 2018, aortic stenosis–related mortality reduced in the United States, because of an accelerated decline between 2015 and 2018.
- Demographic differences existed, whereas geographical patterns demonstrated higher burden of mortality in the rural areas or states located in the West and the Northeast.

**What Are the Clinical Implications?**
- The demographic and regional variations in aortic stenosis mortality might have stemmed from clinical and behavioral heterogeneities as well as socioeconomic disparities, and limited health care access among patients.
- The substantial public health implications call for identification of underlying clinical and social determinants of health to narrow the differences in aortic stenosis mortality.

**Data Source**
We analyzed the Mortality Multiple Cause-of-Death Public Use Record from the National Center for Health Statistics database, which provides mortality data for all US deaths, merged with death certificate data from the Centers for Disease Control and Prevention Wide-Ranging OnLine Data for Epidemiologic Research database. This database includes the assigned cause of mortality from all death certificates filed in the 50 states and District of Columbia. We selected natural deaths (defined by the World Health Organization as the disease or injury that initiated the events leading directly to death as entered by the physician on the death certificate) attributed to AS. In multiple comorbidities (common in AS), the underlying cause is determined by the condition sequence on the certificate, provision of the International Classification of the Diseases, Tenth Revision (ICD-10) codes, and associated selection rules and modifications. We identified AS-related cases using ICD-10 revision codes: I06.0, I06.2, I35.0, and I35.20. To counter the potential ascertainment bias, AS-related mortality rates were corroborated with all-cause, cardiovascular (I00-I78), and cancer-related (C00-C97) mortality (Figure S1); sex- and race-stratified analyses were performed for cancer mortality (Figures S2 and S3) to validate estimates of AS-related mortality. This study did not require institutional review board approval because we analyzed government-issued public-use data without individual identifiable information.

**METHODS**
The Centers for Disease Control and Prevention Wide-Ranging OnLine Data for Epidemiologic Research data sets used in this project are publicly available and are easily replicable from the methods described in the article.

**Nonstandard Abbreviations and Acronyms**

| Abbreviation | Description |
|--------------|-------------|
| AS           | aortic stenosis |
| APC          | annual percentage change |
| AAPC         | average annual percentage change |
| AAMR         | age-adjusted mortality rate |
| AVR          | aortic valve replacement |
| TAVR         | transcatheter aortic valve replacement |

**Data Extraction**
The number of AS-related deaths and population size were abstracted from 2008 to 2018. This period was selected (1) to document contemporary 10-year trends in AS-related mortality and (2) to approximate the changing AS mortality patterns most closely in relation to use of TAVR in the United States. The data were abstracted on age, sex, race, region, states, and place of death. For age, we selected patients aged ≥45 years, and stratified them into 10-year age groups. Race was identified as White, Black, Hispanic, American Indian/Alaskan Native (North, Central, and South American Indians, Eskimos, and Aleuts), and Asian/Pacific Islander (Chinese, Filipino, Hawaiian, Japanese, and other Asian or Pacific Islanders). Regions were classified according to Census Bureau–defined regions into Northeast, Midwest, South, and West. Using the National Center for Health Statistics Urban-Rural Classification Scheme, we divided our population into urban (large metropolitan area [≥1 million], medium/small metropolitan area [50 000–999 999]) and rural (<50 000) counties per the 2013 US census classification. Place of death was categorized as medical facility (inpatient, outpatient, or emergency room), home,

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Disparities and variations in TAVR volumes, it is imperative to identify the patterns of AS-related mortality at the state level in the United States. Moreover, because prior data primarily focused on mortality trends in the inpatient setting, assessment of contemporary trends for individuals with AS is warranted. Death certificates remain the key data source for measuring longitudinal global and local death trends in public health. Accordingly, we used a national-level database examining death certificates to measure AS-related mortality trends in the United States, stratified by demographic and regional characteristics.
hospice facility, nursing home/long-term care, and other.

**Statistical Analysis**

The crude death rates for individual years were calculated by dividing the number of AS-related deaths by the total corresponding population. The annual mortality rates were calculated per 100,000 population with the corresponding 95% CIs. The mortality rates were age-adjusted based on the US standard population from the year 2000. Temporal trends in mortality were examined to identify changes in slope using Joinpoint Regression Program version 4.7.0.0, which models consecutive linear segments on a log scale, connected by joinpoints, where the segments converge. Annual percentage change (APC) with 95% CIs were calculated for the line segments linking a joinpoint using Monte Carlo permutation test. We estimated the weighted average of the APCs to calculate the average APC (AAPC) for entire study period (2008–2018). The AAPC is a summary estimate of the trend over a prespecified fixed time interval, which allows provision of a single numerical measure to describe the AAPCs over a duration of multiple years. This measure is valid even if the joinpoint model suggests changes in trends during those years. Slopes were considered increasing or decreasing if the estimated slope differed significantly from zero. The statistical significance was determined by 2-sided t testing (P=0.05).

**RESULTS**

Between 2008 and 2018, 176,743 AS-related deaths occurred, corresponding to age-adjusted mortality rate (AAMR) of 12.7 (95% CI, 12.6–12.8). The APC in AAMR was stable between 2008 and 2015 (0.4 [95% CI, −0.02 to 0.91]), but there was an accelerated decline between 2015 and 2018 (−4.4 [95% CI, −6.0 to −2.7]; Figure 1). Overall, AAMR reduced from 12.7 (95% CI, 12.5–12.9) to 11.5 (95% CI, 11.3–11.6) with AAPC of −1.0 (95% CI, −1.5 to −0.5).

**Demographic Patterns**

The crude mortality rates increased with age, with exponential distribution (Figure 2). AS-related mortality reduction was most pronounced in patients who were aged 75 to 84 years (AAPC, −2.2 [95% CI, −2.9 to −1.6]). The mortality trend remained flat in patients aged >85 years, because of significant increase in APC in crude death rate between 2008 and 2015 (0.8 [95% CI, 0.2–1.5]), followed by a significant downtrend between 2015 and 2018 (−4.1 [95% CI, −6.5 to −1.7]; Figure S4). Tables S1 and S2 report crude and AAMRs for AS-related mortality; and Table S3 reports the absolute number of AS-related deaths grouped by sex and race in the United States. Overall, men had higher AAMRs than women, and White patients had higher AAMRs than other races. A consistent reduction in mortality was noted in women (AAPC, −1.0 [95% CI, −1.5 to −0.4]) and men (AAPC, −1.0 [95% CI, −1.4 to −0.46]), because of accelerated mortality decline since 2015 in women and 2014 in men into subsequent years (Figure 1). However, this downtrend was not consistent across race. In White patients, APC in AAMR initially increased between 2008 and 2015 (0.6 [95% CI, 0.2–1.0]), followed by reduction through 2018 (−4.0 [95% CI, −5.4 to −2.6]), translating into AAPC of −0.8 (95% CI, −1.2 to −0.4).
−0.4). Conversely, in Black, American Indian/Alaskan Native, and Hispanic patients, the mortality trends remained static, except in Asian/Pacific Islanders, where mortality declined between 2013 and 2018 (−4.2 [95% CI, −7.5 to −0.8]; Figure 3).

Geographical Patterns
Between 2008 and 2018, the AAMRs were higher in rural (13.3–14.3) than urban (12.9–11.5) areas (Figure S5). In the urban areas, the APC in AAMR was stable between 2008 and 2014 (0.6 [95% CI, −0.1 to 1.4]), but there was an accelerated decline between 2014 and 2018 (−3.3 [95% CI, −4.6 to −2.0]). Conversely, in the rural area, APC in AAMR increased between 2008 and 2015 (2.4 [95% CI, 1.7–3.1]), followed by a decline between 2015 and 2018 (−3.4 [95% CI, −5.8 to −0.9]). Across the states, AAMRs varied from 8.0 (95% CI, 7.6–8.4) to 26.6 (95% CI, 25.9–27.3; Figure 4). States with AAMRs >90th percentile were distributed in the West and the Northeast regions (Oregon, Vermont, Washington, Maine, New Hampshire, and Idaho). States with AAMRs <10th percentile were clustered in the South (Texas, Mississippi, District of Columbia, Georgia, and Alabama) (Table S4). The AAMRs for sex and race were highest in the West and lowest in the South. Sex- and age-specific differences were most prominent in the West and least prominent in the Northeast (Figure 5). Race- and age-specific differences were most prominent in the Northeast and least prominent in the South. Death rates classified by sex and race for each individual state are shown in Tables S1 and S2.

Figure 2. Aortic stenosis–related mortality rates in the US regions by age and sex, 2008 to 2018.

Figure 3. Aortic stenosis–related mortality rates stratified by race in the United States, 2008 to 2018.
*Indicates that the annual percentage change (APC) is significantly different from zero at α=0.05.
During the study period, the AAPC remained flat for most states except California (−2.29 [95% CI, −3.86 to −0.69]), New York (−1.64 [95% CI, −2.17 to −1.12]), North Carolina (−1.74 [95% CI, −2.94 to −0.53]), and Oregon (1.22 [95% CI, 0.11–2.33]) (Table S2). However, inflection points were identified in the year 2010 for Washington (−2.59 [95% CI, −3.89 to −1.28]) and Georgia (−3.06 [95% CI, −4.52 to −1.59]); 2012 and 2013 for North Carolina (−4.07 [95% CI, −5.59 to −2.53]) and Virginia (−4.70 [95% CI, −8.34 to −0.91]), respectively; 2014 for New York (−5.56 [95% CI, −6.79 to −4.33]), Arizona (−6.34 [95% CI, −12.15 to −0.15]), and Oregon (−3.60 [95% CI, −6.14 to −1.00]); and 2015 for New Jersey (−6.63 [95% CI, −12.62 to −0.23]). None of the states located in the Midwest showed reduction in AS mortality (Table S5). Tables S6 to S9 report state-level mortality rates stratified by sex and race.

**Location of Death**

Annually, the average absolute number of deaths was highest in the inpatient setting (n=6368), followed by home (n=4188) and nursing home/long-term care facility (n=3190); and lowest in outpatient/emergency department (n=671) and hospice facility (n=850). The APC in number of deaths increased for outpatient/emergency department between 2008 and 2012 (3.6 [95% CI, 0.3–7.1]), followed by decline between 2012 and 2018 (−2.9 [95% CI, −4.6 to −1.2]; Figure S6). A similar trend was noticed for nursing home/long-term care facility. The APC for inpatient deaths initially increased and then stabilized since 2015 onwards. The AAPC increased for deaths at home (3.3 [95% CI, 2.0–4.5]) and hospice facility (13.1 [95% CI, 9.7–16.6]), secondary to significant growth between 2008 and 2014 for home (5.6 [95% CI, 4.2–7.1]) and hospice facilities (19.8 [95% CI, 16.4–23.3]).

**DISCUSSION**

Using contemporary US data, we found some distinct patterns of AS-related mortality during the past 10 years. First, urban-rural differences existed, with higher burden of mortality in rural than urban areas. Second, the mortality varied across states, with higher death rates observed in states located in West and Northeast, and lower in South. Third, demographic disparities were observed at the national and state levels. And fourth, there was an upsurge in the number of patients dying at home and hospice facilities.
Geographical variations in total and cardiovascular mortality in the United States have persisted over the years. In a recent report, rural areas showed greater all-cause mortality rates with absolute rural-urban differences in AAMR doubling between 1999 and 2017. Our study also illustrated higher AAMRs in rural than urban areas. We also identified new hotspots of AS-related death in states located in West and Northeast regions. During the past 5 to 8 years, advancement in AS-related life expectancy was observed in states substantially clustered outside the Midwest. These patterns are partially consistent with overall mortality trends in the United States, and stem from different demographic makeup of the states and their inherent disease risk, heterogeneities in metabolic, behavioral, and clinical risk factors faced by the state's residents, and access to health care that can modify prognosis over time.

The known risk factors for AS include advancing age, men, White race, smoking, obesity, hypertension, atherosclerosis, and congenital bicuspid valve. Different degrees of exposure to cardiometabolic risk factors and higher proportions of men and White population in certain regions can explain some of these trends. For instance, as per the Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System surveys, the recent prevalence of hypertension and obesity, respectively, in Oregon (30.1% and 29.9%), Vermont (30.4% and 27.5%), Washington (29.5% and 28.7%), Maine (34.8% and 30.4%), New Hampshire (30.0% and 29.6%), and Idaho (29.8% and 28.4%) were relatively higher than some states located in lower percentile for AS-related mortality. Similarly, some of these states (Vermont, Maine, New Hampshire, and Idaho) had a higher prevalence of White people than other states.

Similarly, both men and White people had higher AAMRs in West and Northeast states compared with those in South. Another set of potential explanations include socioeconomic pressures and financial hardships that can influence mortality. There was lack of AS-related mortality reduction in areas with history of economic challenges, such as rural areas or the industrial Midwest. However, mortality decline was prominent in states with more robust economies, such as California and New York. Interplay of socioeconomic predictors, such as income, education level, quality of life, exposure to discrimination, and employment status between states and residential minorities can shape the mortality trends. Finally, geographical variation in volume and use of AVR procedures, lower density of TAVR programs in rural areas, and challenges in accessing therapy can largely...

Figure 5. Sex and age-specific aortic stenosis–related crude mortality rates per 100,000 people in the US regions, 2008 to 2018.
influence mortality.5 Recently, residents of rural counties in Florida were shown to travel an extra 44 miles for TAVR and experience ≈7-fold lower rates of TAVR procedures compared with heavily populated regions.15,21

Prior evidence showed that AS-related morality decline was exclusively limited to patients aged ≥80 years.1 We document an overall improvement in life expectancy in those aged 75 to 84 years during the past decade, and reversal of escalating mortality in those aged >85 years since 2015. These statistics signal the penetration of therapeutic benefits of TAVR in this target population, who may not have been candidates for surgical AVR procedures in the past. Although reductions in mortality were uniformly distributed across sexes, these patterns were not observed across race. The national data of inpatient hospitalization and Medicare beneficiaries showed that Black patients had lower proportion of AS-related hospitalization and received fewer AVR procedures than White patients.4,22 The transcatheter valve therapy registry from 2011 to 2016 showed that among 70,221 patients undergoing TAVR, 91% were White, 3.8% were Black, 3.4% were Hispanic, and 1.5% were Asian/Pacific Islander and American Indian/Alaskan Native patients.14 The potential reasons for this imbalance include lower prevalence of AS in non-White patients compared with White patients, referral bias for AVR favoring White people over other races,22 detection bias, where patients belonging to higher-income class were diagnosed more than poor.20 Some of these factors might explain reduction in AS mortality in White compared with non-White patients.

Location of death is an important component of end-of-life care experience.9 Overall proportion of AS-related deaths was higher in the inpatient setting. However, there was an emerging trend favoring more patients dying at home and hospice facilities. The most remarkable (~20%) increase was noticed in patients dying at hospice facility. This trend is consistent with general population and patients with cardiovascular disease,9,23 and reflects the use of palliative care in patients with debilitating symptoms without cure.

This study has various limitations. Vital statistics and census population data rely on death certificates. These sources are subject to error because reporting of deaths might vary across the states or deaths within the population might be missed or allocated to wrong state.6 Inaccurate ascertainment of demographic information and cause of death based on ICD-10 codes, which are subject to misclassification, can bias the results.12 Analysis of the FHS (Framingham Heart Study) showed mismatch between true versus reported causes of death in decedents aged >85 years.26 In-hospital mortality rates might be higher because AS is more readily diagnosed in the hospital than in those at the time of death. This might influence the estimates on location of death. The data set lacks the information on prevalence of AS or AVR rates. However, although the frequency of TAVR has increased, prevalence of AS does not seem to have changed over the years.4,14,22,27 Because data were missing on pertinent clinical and social determinants of health, and regional growth rates of transcatheter or surgical AVR in the United States, the predictors of mortality could not be analyzed. Finally, the vital statistic records deaths to state of residence at the time of death, and does not factor migration between the states.8

In summary, AS-related mortality has reduced in the United States during the past 10 years, with the decline being more prominent in the second half of the decade. However, the downward trend in mortality was not consistent among all demographic groups or across all the states. The demographic and regional variations might have emerged from different clinical and social determinants of health among patients. Future studies designed to explore underlying clinical mechanisms, social disparities, and access to healthcare issues might shed further light to explain community-level variations in AS-related mortality.

ARTICLE INFORMATION

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Disclosures

None.

Supplementary Material

Tables S1–S9

Figures S1–S6

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Supplemental Material
### Table S1. Aortic Stenosis Related Mortality Stratified by Age in the United States, 2008-2018.

| State               | Number of deaths | Population     | Overall | 45-54 years | 55-64 years | 65-74 years | 75-84 years | >85 years | Age-adjusted death rate [95% CI] |
|---------------------|------------------|----------------|---------|-------------|-------------|-------------|-------------|-----------|---------------------------------|
| Entire population   | 176,743          | 1,403,676,550  | 12.6 [12.5, 12.7] | 0.6 | 1.6 | 5.6 | 27.8 | 167.5 | 12.7 [12.6, 12.8] |
| Alabama             | 1,655            | 22,056,123     | 7.5 [7.1, 7.9] | 0.5 | 1.6 | 4.6 | 19.8 | 90.0  | 8.0 [7.6, 8.4]  |
| Alaska              | 286              | 2,845,879      | 10.0 [8.9, 11.2] | 2.4 | 7.4 | 42.9 | 225.8 | 17.8 [15.7, 19.9] |
| Arizona             | 3,075            | 29,120,788     | 10.6 [10.2, 10.9] | 0.6 | 1.7 | 4.9 | 22.5 | 134.4 | 10.5 [10.1, 10.8] |
| Arkansas            | 1,319            | 13,319,205     | 9.9 [9.4, 10.4] | 0.7 | 1.7 | 6.1 | 23.6 | 113.4 | 9.9 [9.4, 10.5]  |
| California          | 19,163           | 158,207,289    | 12.1 [11.9, 12.3] | 0.5 | 1.6 | 5.0 | 26.3 | 169.5 | 12.5 [12.3, 12.6] |
| Colorado            | 2,151            | 22,244,085     | 9.7 [9.3, 10.1] | 0.5 | 1.2 | 4.9 | 25.2 | 152.0 | 11.4 [10.9, 11.9] |
| Connecticut         | 2,540            | 17,245,909     | 14.7 [14.2, 15.3] | 1.1 | 4.5 | 27.4 | 187.8 | 13.1 [12.6, 13.6] |
| Delaware            | 514              | 4,394,589      | 11.7 [10.7, 12.7] | 1.5 | 6.0 | 24.3 | 164.3 | 12.0 [11.0, 13.1] |
| District of Columbia| 205              | 2,395,956      | 8.6 [7.4, 9.7] | 16.2 | 113.0 | 8.3 [7.1, 9.4]  |
| Florida             | 11,431           | 98,475,823     | 11.6 [11.4, 11.8] | 0.6 | 1.6 | 4.9 | 21.4 | 126.6 | 9.9 [9.8, 10.1]  |
| Georgia             | 2,739            | 41,239,447     | 6.6 [6.4, 6.9] | 0.4 | 1.5 | 3.8 | 19.7 | 102.4 | 8.3 [8.0, 8.7]  |
| Hawaii              | 841              | 6,401,149      | 13.1 [12.3, 14.0] | 1.9 | 5.4 | 22.7 | 147.0 | 11.0 [10.3, 11.8] |
| Idaho               | 1,203            | 6,850,838      | 17.6 [16.6, 18.6] | 1.6 | 5.9 | 38.8 | 268.0 | 18.6 [17.5, 19.6] |
| Illinois            | 6,453            | 56,123,287     | 11.5 [11.2, 11.8] | 0.4 | 1.5 | 5.1 | 24.8 | 150.5 | 11.4 [11.1, 11.7] |
| Indiana             | 3,766            | 29,044,072     | 13.0 [12.6, 13.4] | 0.6 | 1.9 | 6.8 | 30.3 | 163.7 | 13.2 [12.8, 13.6] |
| Iowa                | 2,860            | 14,213,150     | 20.1 [19.4, 20.9] | 0.6 | 1.6 | 6.9 | 34.6 | 233.9 | 16.8 [16.2, 17.4] |
| Kansas              | 1,892            | 12,504,432     | 15.1 [14.4, 15.8] | 0.6 | 1.5 | 6.7 | 31.9 | 175.1 | 13.8 [13.1, 14.4] |
| Kentucky            | 1,709            | 20,006,843     | 8.5 [8.1, 8.9] | 0.5 | 1.3 | 5.2 | 23.4 | 108.7 | 9.4 [8.9, 9.8]  |
| Louisiana           | 1,762            | 19,873,936     | 8.9 [8.5, 9.3] | 0.8 | 1.7 | 5.5 | 25.2 | 109.1 | 9.9 [9.4, 10.3] |
| Maine               | 1,480            | 7,049,284      | 21.0 [19.9, 22.1] | 2.1 | 9.0 | 46.3 | 273.4 | 20.5 [19.5, 21.6] |
| Maryland            | 2,964            | 26,579,275     | 11.2 [10.8, 11.6] | 0.5 | 1.3 | 5.4 | 27.4 | 155.2 | 12.0 [11.5, 12.4] |
| Massachusetts       | 5,215            | 31,208,510     | 16.7 [16.3, 17.2] | 0.5 | 1.3 | 5.0 | 32.8 | 217.0 | 15.3 [14.9, 15.8] |
| Michigan            | 5,857            | 46,647,612     | 12.6 [12.2, 12.9] | 0.5 | 1.9 | 5.7 | 28.6 | 158.3 | 12.5 [12.2, 12.8] |
| Minnesota           | 4,348            | 24,317,043     | 17.9 [17.3, 18.4] | 0.5 | 1.7 | 6.4 | 34.3 | 241.2 | 17.0 [16.5, 17.5] |
| Mississippi         | 1,010            | 12,953,373     | 7.8 [7.3, 8.3] | 0.9 | 2.1 | 5.6 | 20.8 | 84.6  | 8.4 [7.9, 8.9]  |
| Missouri            | 3,719            | 27,662,944     | 13.4 [13.0, 13.9] | 0.7 | 1.5 | 5.8 | 29.9 | 170.1 | 13.2 [12.7, 13.6] |
| Montana             | 813              | 4,932,827      | 16.5 [15.3, 17.6] | 1.7 | 6.6 | 36.2 | 218.8 | 16.3 [15.1, 17.4] |
| Nebraska            | 1,456            | 8,113,061      | 17.9 [17.0, 18.9] | 0.8 | 1.8 | 5.6 | 32.5 | 221.2 | 15.8 [15.0, 16.7] |
| Nevada              | 992              | 12,159,773     | 8.2 [7.7, 8.7] | 0.5 | 1.6 | 5.5 | 22.0 | 126.7 | 10.1 [9.5, 10.7] |
| State                  | Total Population | Total Deaths | Age-Adjusted Mortality Rate | 95% CI for Age-Adjusted Mortality Rate |
|-----------------------|------------------|--------------|-----------------------------|--------------------------------------|
| New Hampshire         | 1,175,000        | 6,695,032    | 17.6 [16.5, 18.6]           | 1.8 [1.7, 1.9]                      |
| New Jersey            | 6,143,000        | 41,147,745   | 14.9 [14.6, 15.3]           | 0.5 [0.4, 0.6]                      |
| New Mexico            | 752,000          | 9,272,492    | 8.1 [7.5, 8.7]              | 1.8 [1.7, 1.9]                      |
| New York              | 10,213,000       | 88,664,277   | 11.5 [11.3, 11.7]           | 0.3 [0.2, 0.4]                      |
| North Carolina        | 5,160,000        | 43,970,232   | 11.7 [11.4, 12.1]           | 0.6 [0.5, 0.7]                      |
| North Dakota          | 447,000          | 3,111,774    | 14.4 [13.0, 15.7]           | 5.5 [5.3, 5.7]                      |
| Ohio                  | 7,423,000        | 54,207,144   | 13.7 [13.4, 14.0]           | 0.6 [0.5, 0.7]                      |
| Oklahoma              | 1,549,000        | 16,631,544   | 9.3 [8.8, 9.8]              | 0.5 [0.4, 0.6]                      |
| Oregon                | 4,990,000        | 18,310,826   | 27.3 [26.5, 28.0]           | 0.8 [0.7, 0.9]                      |
| Pennsylvania          | 12,138,000       | 62,073,610   | 19.6 [19.2, 19.9]           | 0.7 [0.6, 0.8]                      |
| Rhode Island          | 742,000          | 5,014,440    | 14.8 [13.7, 15.9]           | 5.0 [4.8, 5.2]                      |
| South Carolina        | 2,431,000        | 22,071,803   | 11.0 [10.6, 11.5]           | 0.7 [0.6, 0.8]                      |
| South Dakota          | 590,000          | 3,782,478    | 15.6 [14.3, 16.9]           | 5.1 [4.9, 5.3]                      |
| Tennessee             | 3,167,000        | 29,542,896   | 10.7 [10.3, 11.1]           | 0.8 [0.7, 0.9]                      |
| Texas                 | 7,998,000        | 102,454,518  | 7.8 [7.6, 8.0]              | 0.5 [0.4, 0.6]                      |
| Utah                  | 887,000          | 9,482,591    | 9.4 [8.7, 10.0]             | 0.6 [0.5, 0.7]                      |
| Vermont               | 769,000          | 3,191,207    | 24.1 [22.4, 25.8]           | 2.0 [1.9, 2.1]                      |
| Virginia              | 4,026,000        | 36,367,503   | 11.1 [10.7, 11.4]           | 0.5 [0.4, 0.6]                      |
| Washington            | 6,333,000        | 30,878,750   | 20.5 [20.0, 21.0]           | 0.8 [0.7, 0.9]                      |
| West Virginia         | 1,042,000        | 9,292,823    | 11.2 [10.5, 11.9]           | 1.4 [1.3, 1.5]                      |
| Wisconsin             | 5,024,000        | 26,766,339   | 18.8 [18.3, 19.3]           | 0.6 [0.5, 0.7]                      |
| Wyoming               | 326,000          | 2,560,024    | 12.7 [11.4, 14.1]           | 7.4 [7.2, 7.6]                      |

| Sex                     |                  |              |                             |                                      |
|------------------------|------------------|--------------|-----------------------------|--------------------------------------|
| Women                  | 102,084,000      | 743,730,147  | 13.7 [13.6, 13.8]           | 0.3 [0.3, 0.4]                      |
| Men                    | 74,659,000       | 659,946,403  | 13.3 [11.2, 11.4]           | 0.8 [0.7, 0.9]                      |

| Race                   |                  |              |                             |                                      |
|------------------------|------------------|--------------|-----------------------------|--------------------------------------|
| Whites                 | 165,999,000      | 1,162,397,579| 14.3 [14.2, 14.4]           | 0.6 [0.6, 0.7]                      |
| Blacks                 | 7,510,000        | 157,593,908  | 4.8 [4.7, 4.9]              | 0.7 [0.7, 0.8]                      |
| Asians or Pacific Islanders | 2,646,000   | 69,817,576   | 3.8 [3.6, 3.9]              | 0.2 [0.2, 0.3]                      |
| American Indians or Alaska Natives | 588,000    | 13,867,487   | 4.2 [3.9, 4.6]              | 0.7 [0.7, 0.8]                      |
| Hispanics              | 6,366,000        | 146,749,567  | 4.3 [4.2, 4.4]              | 0.4 [0.4, 0.5]                      |

Displayed is the total population and number of aortic-stenosis related deaths in each state between 2008 and 2018. The colors represent the value of the observed age-adjusted mortality rates per 100,000 persons, ranging from green (lowest) to red (highest). Cells are empty if no data were available.
Table S2. Trends in Age-Adjusted Aortic Stenosis-Related Mortality Rates in the United States, 2008-2018.

| State               | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | AAPC [95% CI] |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|----------------|
| Entire population   | 12.7 | 12.8 | 13.0 | 12.8 | 12.9 | 13.3 | 13.2 | 13.0 | 12.5 | 12.1 | 11.5 | -2.96 [-6.16, 0.35] |
| Alabama             | 8.6  | 8.8  | 9.2  | 8.1  | 8.4  | 8.6  | 9.1  | 7.6  | 6.4  | 7.7  | 6.5  | -1.84 [-4.39, 0.77] |
| Alaska              |      | 17.5 | 22.3 | 21.5 | 16.0 | 19.6 | 18.9 | 20.2 | 19.8 | 15.7 | 15.4 | 4.47 [-70.05, 599.3] |
| Arizona             | 10.6 | 10.7 | 10.6 | 11.9 | 10.1 | 11.7 | 11.3 | 10.7 | 10.0 | 9.8  | 8.5  | -1.84 [-4.39, 0.77] |
| Arkansas            | 9.4  | 8.1  | 10.4 | 9.3  | 10.9 | 10.9 | 10.8 | 9.5  | 9.6  | 10.7 | 9.4  | 0.82 [-3.17, 4.97]  |
| California          | 13.4 | 13.5 | 13.5 | 12.5 | 12.8 | 13.2 | 13.2 | 12.4 | 12.3 | 11.3 | 10.8 | -2.29 [-3.86, -0.69] |
| Colorado            | 10.0 | 12.1 | 11.1 | 12.6 | 12.1 | 11.7 | 12.2 | 10.8 | 11.7 | 11.4 | 10.1 | 0.23 [-2.92, 3.48]  |
| Connecticut         | 14.7 | 12.3 | 15.9 | 13.4 | 12.8 | 11.2 | 13.7 | 13.4 | 12.9 | 12.3 | 11.8 | -1.5 [-4.97, 2.11]  |
| Delaware            | 12.8 | 11.5 | 9.9  | 11.6 | 10.5 | 12.6 | 15.5 | 9.8  | 12   | 11.4 | 14.2 | 0.22 [-8.91, 10.27] |
| District of Columbia|      |      |      |      |      |      |      |      |      |      |     | -              |
| Florida             | 10.8 | 10.4 | 10.3 | 9.5  | 10.4 | 9.8  | 11.0 | 10.0 | 9.8  | 9.2  | 8.8  | -1.64 [-4.07, 0.86] |
| Georgia             | 9.1  | 8.5  | 10.0 | 8.7  | 8.6  | 8.3  | 8.3  | 8.5  | 7.9  | 7.7  | 6.9  | -1.87 [-4.22, 0.53] |
| Hawaii              | 9.7  | 11.9 | 8.5  | 10.3 | 13.9 | 14.6 | 8.5  | 11.7 | 11.0 | 10.1 | 11.3 | 0.88 [-7.17, 9.64]  |
| Idaho               | 18.8 | 17.3 | 20.3 | 16.5 | 17.8 | 19.9 | 19.5 | 18.1 | 21.4 | 18.3 | 16.5 | -0.73 [-5.26, 4.02] |
| Illinois            | 11.1 | 11.1 | 11.3 | 11.5 | 11.2 | 11.9 | 12.3 | 11.6 | 11.5 | 11.8 | 9.8  | -0.89 [-2.4, 0.66]  |
| Indiana             | 13.1 | 11.9 | 12.6 | 14.0 | 13.7 | 14.1 | 12.9 | 13.9 | 13.3 | 13.3 | 12.3 | 0.2 [-2.11, 2.56]   |
| Iowa                | 16.4 | 15.1 | 15.4 | 15.4 | 18.3 | 16.0 | 18.7 | 18.7 | 16.7 | 18.4 | 1.47 [-2.91, 6.05]  |
| Kansas              | 11.3 | 14.7 | 15.8 | 12.0 | 11.5 | 15.0 | 14.8 | 13.8 | 14.1 | 15.2 | 13.1 | 1.5 [-4.34, 7.69]   |
| Kentucky            | 7.4  | 8.1  | 9.0  | 10.4 | 10.0 | 9.7  | 9.0  | 11.0 | 9.9  | 8.5  | 2.47 [-1.45, 6.54]  |
| Louisiana           | 10.8 | 11.9 | 10.9 | 9.3  | 9.0  | 10.1 | 9.2  | 9.8  | 8.6  | 10.3 | 9.0  | -2.05 [-5.58, 1.62] |
| Maine               | 19.3 | 18   | 17.2 | 17.8 | 20.3 | 18.8 | 20.2 | 23.3 | 27.5 | 19.3 | 23.3 | 2.34 [-5.08, 10.33] |
| Maryland            | 12.3 | 12.2 | 12.3 | 11.7 | 12.2 | 12.3 | 12.4 | 11.3 | 11.3 | 12.4 | 11.5 | -0.45 [-2.34, 1.48] |
| Massachusetts       | 15.4 | 15.7 | 15.8 | 15.7 | 14.8 | 17.1 | 15.0 | 16.0 | 15.7 | 14.0 | 13.6 | -1.53 [-4.3, 1.32]  |
| Michigan            | 12.5 | 11.3 | 12.2 | 11.6 | 12.5 | 12.2 | 13.3 | 13.7 | 13.5 | 12.4 | 12.2 | 0.35 [-2.61, 3.39]  |
| Minnesota           | 16.4 | 16.6 | 17.3 | 16.1 | 16.9 | 17.5 | 17.0 | 18   | 17.9 | 16.3 | 16.5 | -0.13 [-1.84, 1.61] |
| Mississippi         | 8.2  | 7.4  | 8.7  | 7.2  | 9.4  | 8.7  | 9.2  | 9.3  | 7.4  | 8.8  | 7.5  | -0.03 [-4.81, 1.5]  |
| Missouri            | 11.5 | 13.2 | 12.5 | 14.1 | 13.8 | 12.9 | 14.8 | 13.9 | 13.7 | 12.4 | 11.8 | -0.11 [-2.57, 2.4]  |
| Montana             | 14.2 | 10.8 | 18.4 | 20.3 | 17.2 | 17.3 | 16.1 | 15.7 | 16.3 | 15.2 | 16.9 | 2.19 [-4.63, 9.5]   |
| Nebraska            | 12.7 | 14.8 | 14.9 | 14.8 | 18.0 | 17.0 | 19.2 | 17.0 | 15.2 | 15.0 | 15.3 | 0.84 [-1.76, 3.51]  |
| Nevada              | 13.5 | 7.8  | 11.2 | 9.7  | 9.9  | 8.0  | 8.8  | 11.5 | 11.2 | 11.2 | 8.7  | -0.48 [-8.58, 8.34] |
| New Hampshire       | 15.2 | 18.8 | 22.0 | 17.8 | 20.0 | 18.8 | 19.1 | 18.4 | 18.3 | 17.8 | 19.2 | 1.42 [-1.18, 4.09]  |
| New Jersey          | 15.0 | 13.6 | 14.1 | 14.6 | 15.0 | 14.4 | 15.5 | 15.4 | 13.9 | 13.1 | 12.5 | -1.37 [-3.2, 0.5]   |
| Race                        | Women | Men     | Whites | 13.6 | 13.7 | 14.1 | 14.1 | 14.4 | 15.0 | 14.9 | 15.0 | 14.5 | 14.1 | 13.9 | 13.2 | 12.6 | 11.5 | 11.3 | 10.7 | -1.0 [-1.5, -0.4] |
|-----------------------------|-------|---------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Blacks                      | 4.6   | 4.7     | 4.6   | 4.6  | 4.3  | 4.8  | 5.3  | 4.6  | 4.8  | 4.9  | 5.0  | -0.4 [-1.4, 0.7] | -1.1 [-3.0, 0.9] |
| Asians or Pacific Islanders | 3.2   | 3.6     | 3.3   | 3.8  | 4.3  | 3.8  | 4.1  | 3.8  | 3.8  | 3.8  | -2.5 [-7.6, 2.8] |
| American Indians or Alaska Natives | 8.4 | 6.9     | 6.2   | 8.1  | 7.5  | 6.7  | 7.9  | 6.3  | 5.8  | 5.5  | 6.7  | -0.7 [-3.8, 2.5] | -2.5 [-7.6, 2.8] |
| Hispanics                   | 6.3   | 7.0     | 7.0   | 5.8  | 6.6  | 7.0  | 6.9  | 6.7  | 6.3  | 6.4  | 6.0  | -0.7 [-3.8, 2.5] | -2.5 [-7.6, 2.8] |

Observed age-adjusted mortality rates are reported for individual states and for the entire population between 2008 and 2018. The colors represent the value of the observed age-adjusted mortality rates per 100,000 persons, ranging from green (lowest) to red (highest). Cells are empty if no data were available. AAPC stands for Average Annual Percentage Change. Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05.
Table S3. Absolute Number of Aortic Stenosis Related Deaths Stratified by Sex and Race in the United States, 2008-2018.

| Year | Women | Men  | Whites | Blacks | Asians/PI | AI/AN | Hispanics | Total Population |
|------|-------|------|--------|--------|-----------|-------|-----------|-----------------|
| 2008 | 8440  | 5818 | 13468  | 582    | 160       | 48    | 411       | 117395131       |
| 2009 | 8680  | 5966 | 13804  | 610    | 189       | 43    | 472       | 119895863       |
| 2010 | 9014  | 6192 | 14371  | 618    | 179       | 38    | 492       | 121757429       |
| 2011 | 8994  | 6518 | 14613  | 632    | 216       | 51    | 449       | 124174484       |
| 2012 | 9260  | 6770 | 15132  | 611    | 231       | 56    | 535       | 126000296       |
| 2013 | 9640  | 7209 | 15839  | 688    | 271       | 51    | 613       | 127788037       |
| 2014 | 9747  | 7306 | 15972  | 772    | 250       | 59    | 638       | 129779643       |
| 2015 | 9891  | 7351 | 16226  | 686    | 275       | 55    | 675       | 131826832       |
| 2016 | 9627  | 7335 | 15874  | 741    | 291       | 56    | 670       | 133494018       |
| 2017 | 9585  | 7170 | 15634  | 772    | 289       | 60    | 710       | 135229289       |
| 2018 | 9206  | 7024 | 15066  | 798    | 295       | 71    | 701       | 136335528       |

AI/AN = American Indians or Alaska Natives; PI = Pacific Islanders
### Table S4. Aortic Stenosis Related Mortality Stratified by States in the United States, 2008-2018.

| States          | Rank | Percentile | AAMR per 100,000 |
|-----------------|------|------------|------------------|
| Oregon          | 1    | 100.00%    | 26.6             |
| Vermont         | 2    | 98.00%     | 24.3             |
| Washington      | 3    | 96.00%     | 21.8             |
| Maine           | 4    | 94.00%     | 20.5             |
| New Hampshire   | 5    | 92.00%     | 18.7             |
| Idaho           | 6    | 90.00%     | 18.6             |
| Wisconsin       | 7    | 88.00%     | 17.9             |
| Alaska          | 8    | 86.00%     | 17.8             |
| Minnesota       | 9    | 82.00%     | 17.0             |
| Pennsylvania    | 9    | 82.00%     | 17.0             |
| Iowa            | 11   | 80.00%     | 16.8             |
| Montana         | 12   | 78.00%     | 16.3             |
| Nebraska        | 13   | 76.00%     | 15.8             |
| Massachusetts   | 14   | 74.00%     | 15.3             |
| New Jersey      | 15   | 72.00%     | 14.3             |
| Wyoming         | 16   | 70.00%     | 14.0             |
| Kansas          | 17   | 68.00%     | 13.8             |
| South Dakota    | 18   | 66.00%     | 13.4             |
| Ohio            | 19   | 64.00%     | 13.3             |
| Indiana         | 20   | 60.00%     | 13.2             |
| Missouri        | 20   | 60.00%     | 13.2             |
| Connecticut     | 22   | 58.00%     | 13.1             |
| North Carolina  | 23   | 56.00%     | 12.8             |
| Rhode Island    | 24   | 54.00%     | 12.6             |
| California      | 25   | 50.00%     | 12.5             |
| Michigan        | 25   | 50.00%     | 12.5             |
| Virginia        | 27   | 48.00%     | 12.4             |
| South Carolina  | 28   | 46.00%     | 12.3             |
| Delaware        | 29   | 42.00%     | 12.0             |
| Maryland        | 29   | 42.00%     | 12.0             |
| North Dakota    | 31   | 40.00%     | 11.9             |
| Tennessee       | 32   | 38.00%     | 11.7             |
| State         | Rank | Age Adjusted Mortality Rate (AAMR) | Percentile |
|--------------|------|-----------------------------------|------------|
| Colorado     | 33   | 34.00%                            | 11.4       |
| Illinois     | 33   | 34.00%                            | 11.4       |
| West Virginia| 35   | 32.00%                            | 11.3       |
| Hawaii       | 36   | 30.00%                            | 11.0       |
| New York     | 37   | 28.00%                            | 10.8       |
| Utah         | 38   | 26.00%                            | 10.6       |
| Arizona      | 39   | 24.00%                            | 10.5       |
| Nevada       | 40   | 22.00%                            | 10.1       |
| Arkansas     | 41   | 16.00%                            | 9.9        |
| Florida      | 41   | 16.00%                            | 9.9        |
| Louisiana    | 41   | 16.00%                            | 9.9        |
| Oklahoma     | 44   | 14.00%                            | 9.6        |
| Kentucky     | 45   | 12.00%                            | 9.4        |
| Texas        | 46   | 10.00%                            | 9.2        |
| New Mexico   | 47   | 8.00%                             | 8.5        |
| Mississippi  | 48   | 6.00%                             | 8.4        |
| District of Columbia | 49 | 2.00%                             | 8.3        |
| Georgia      | 49   | 2.00%                             | 8.3        |
| Alabama      | 51   | 0.00%                             | 8.0        |

States are arranged based on percentile ranked from highest to lowest age adjusted mortality rates (AAMR) per 100,000 persons.
Table S5. State-Wise Trends in Aortic Stenosis Related Mortality in the United States, 2008-2018.

| States         | Joinpoint year | APC  | 95% Confidence interval | P-value |
|----------------|----------------|------|-------------------------|---------|
| Alabama        | 2008 2014      | -0.67| -4.91 - 3.77            | 0.72    |
|                | 2014 2018      | -6.3 | -13.65 - 1.68           | 0.10    |
| Alaska         | 2008 2010      | 4255.46| -99.47 - 35739896       | 0.35    |
|                | 2010 2018      | -38.22| -76.89 - 65.17          | 0.28    |
| Arizona        | 2008 2014      | 1.28 | -2.13 - 4.8             | 0.40    |
|                | 2014 2018      | -6.34*| -12.15 - 0.15           | 0.05    |
| Arkansas       | 2008 2013      | 4.11 | -3.04 - 11.8            | 0.22    |
|                | 2013 2018      | -2.37| -9.08 - 4.84            | 0.44    |
| California     | 2008 2016      | -1.25*| -2.25 - 0.25            | 0.02    |
|                | 2016 2018      | -6.33| -14.64 - 2.79           | 0.14    |
| Colorado       | 2008 2011      | 6.26 | -5.06 - 18.92           | 0.24    |
|                | 2011 2018      | -2.25| -5.14 - 0.74            | 0.11    |
| Connecticut    | 2008 2013      | -2.43| -8.43 - 3.96            | 0.38    |
|                | 2013 2018      | -0.55| -6.66 - 5.97            | 0.84    |
| Delaware       | 2008 2010      | -8.11| -46.8 - 58.7            | 0.72    |
|                | 2010 2018      | 2.42 | -3.51 - 8.72            | 0.36    |
| District of Columbia | 2008 2016 |       |                         |         |
|                | 2016 2018      |       |                         |         |
| Florida        | 2008 2015      | -0.32| -2.66 - 2.06            | 0.75    |
|                | 2015 2018      | -4.63| -12.71 - 4.2            | 0.24    |
| Georgia        | 2008 2010      | 3.02 | -10.31 - 18.34          | 0.62    |
|                | 2010 2018      | -3.06*| -4.52 - 1.59           | <0.01   |
| Hawaii         | 2008 2012      | 5.91 | -13.52 - 29.71          | 0.51    |
|                | 2012 2018      | -2.34| -12.36 - 8.84           | 0.61    |
| Idaho          | 2008 2016      | 1.31 | -1.6 - 4.31             | 0.32    |
|                | 2016 2018      | -8.49| -29.95 - 19.55          | 0.45    |
| Illinois       | 2008 2016      | 1.02*| 0.06 - 2              | 0.04    |
|                | 2016 2018      | -8.17| -15.92 - 0.3            | 0.06    |
| Indiana        | 2008 2013      | 2.34 | -1.78 - 6.63            | 0.22    |
|                | 2013 2018      | -1.9 | -5.85 - 2.22            | 0.30    |
| Iowa           | 2008 2010      | -2.29| -24.1 - 25.79           | 0.83    |
|                | 2010 2018      | 2.44 | -0.35 - 5.3             | 0.08    |
| State       | Year 1 | Year 2 | Percent Change | Percent Change | Value 1 | Value 2 |
|------------|--------|--------|----------------|----------------|---------|---------|
| Kansas     | 2008   | 2010   | 7.52           | -23.38         | 50.88   | 0.62    |
|            | 2010   | 2018   | 0.05           | -3.58          | 3.82    | 0.97    |
| Kentucky   | 2008   | 2011   | 11.35          | -2.96          | 27.78   | 0.10    |
|            | 2011   | 2018   | -1.12          | -4.69          | 2.59    | 0.48    |
| Louisiana  | 2008   | 2012   | -4.98          | -13.11         | 3.92    | 0.21    |
|            | 2012   | 2018   | -0.05          | -4.72          | 4.85    | 0.98    |
| Maine      | 2008   | 2010   | -3.84          | -37.48         | 47.88   | 0.83    |
|            | 2010   | 2018   | 3.94           | -0.83          | 8.94    | 0.09    |
| Maryland   | 2008   | 2016   | -0.66          | -1.84          | 0.54    | 0.22    |
|            | 2016   | 2018   | 0.4            | -10.02         | 12.03   | 0.93    |
| Massachusetts | 2008  | 2016   | 0.08           | -1.69          | 1.88    | 0.92    |
|            | 2016   | 2018   | -7.71          | -21.6          | 8.64    | 0.27    |
| Michigan   | 2008   | 2016   | 1.78           | -0.1           | 3.7     | 0.06    |
|            | 2016   | 2018   | -5.19          | -20.08         | 12.47   | 0.47    |
| Minnesota  | 2008   | 2016   | 0.95           | -0.13          | 2.04    | 0.08    |
|            | 2016   | 2018   | -4.31          | -13.32         | 5.63    | 0.32    |
| Mississippi | 2008  | 2014   | 2.81           | -3.55          | 9.59    | 0.33    |
|            | 2014   | 2018   | -4.13          | -14.93         | 8.03    | 0.42    |
| Missouri   | 2008   | 2014   | 3.15           | -0.14          | 6.55    | 0.06    |
|            | 2014   | 2018   | -4.82          | -10.42         | 1.13    | 0.09    |
| Montana    | 2008   | 2011   | 13.94          | -10.73         | 45.41   | 0.24    |
|            | 2011   | 2018   | -2.47          | -8.62          | 4.1     | 0.38    |
|            | 2012   | 2018   | -0.05          | -4.72          | 4.85    | 0.98    |
| Nebraska   | 2008   | 2014   | 5.64*          | 2.11           | 9.29    | 0.01    |
|            | 2014   | 2018   | -5.95          | -11.74         | 0.23    | 0.06    |
| Nevada     | 2008   | 2013   | -4.02          | -17.38         | 11.49   | 0.53    |
|            | 2013   | 2018   | 3.2            | -11.16         | 19.89   | 0.63    |
| New Hampshire | 2008 | 2010   | 13.62          | -2.07          | 31.84   | 0.08    |
|            | 2010   | 2018   | -1.42          | -3             | 0.19    | 0.07    |
| New Jersey | 2008   | 2015   | 0.98           | -0.79          | 2.79    | 0.23    |
|            | 2015   | 2018   | -6.63*         | -12.62         | -0.23   | 0.04    |
| New Mexico | 2008   | 2015   | 0.88           | -3.49          | 5.44    | 0.65    |
|            | 2015   | 2018   | -12.3          | -25.67         | 3.48    | 0.10    |
| New York   | 2008   | 2014   | 1.06*          | 0.36           | 1.77    | 0.01    |
|            | 2014   | 2018   | -5.56*         | -6.79          | <0.01   |         |
| State          | Year       | Year       | Value1 | Value2 | Value3 | Value4 | Value5 |
|---------------|------------|------------|--------|--------|--------|--------|--------|
| North Carolina| 2008       | 2012       | 1.86   | -1.14  | 4.94   | 0.18   |
|               | 2012       | 2018       | -4.07* | -5.59  | -2.53  | <0.01  |
| North Dakota  | 2008       | 2013       | -4.55  | -17.42 | 10.32  | 0.46   |
|               | 2013       | 2018       | 7.13   | -7.31  | 23.83  | 0.29   |
| Ohio          | 2008       | 2015       | 0.39   | -1.42  | 2.23   | 0.62   |
|               | 2015       | 2018       | -3.29  | -9.66  | 3.52   | 0.27   |
| Oklahoma      | 2008       | 2016       | -1.92  | -4.79  | 1.03   | 0.16   |
|               | 2016       | 2018       | -7.11  | -29.22 | 21.91  | 0.53   |
| Oregon        | 2008       | 2014       | 4.56*  | 3.08   | 6.07   | <0.01  |
|               | 2014       | 2018       | -3.60* | -6.14  | -1.00  | 0.02   |
| Pennsylvania  | 2008       | 2015       | 0.8    | -0.49  | 2.1    | 0.18   |
|               | 2015       | 2018       | -2.74  | -7.32  | 2.07   | 0.21   |
| Rhode Island  | 2008       | 2013       | 2.75   | -6.28  | 12.64  | 0.50   |
|               | 2013       | 2018       | -0.03  | -8.82  | 9.6    | 0.99   |
| South Carolina| 2008       | 2016       | -0.55  | -1.66  | 0.57   | 0.27   |
|               | 2016       | 2018       | -3.06  | -12.53 | 7.43   | 0.49   |
| South Dakota  | 2008       | 2011       | -1.6   | -21.3  | 23.02  | 0.87   |
|               | 2011       | 2018       | 1.21   | -4.65  | 7.44   | 0.64   |
| Tennessee     | 2008       | 2012       | 6.70*  | 1.53   | 12.13  | 0.02   |
|               | 2012       | 2018       | -2.59  | -5.14  | 0.03   | 0.05   |
| Texas         | 2008       | 2013       | 0.01   | -2.9   | 3      | 1.00   |
|               | 2013       | 2018       | -2.49  | -5.33  | 0.43   | 0.08   |
| Utah          | 2008       | 2015       | 0.21   | -4.21  | 4.82   | 0.91   |
|               | 2015       | 2018       | -4.96  | -19.71 | 12.48  | 0.49   |
| Vermont       | 2008       | 2012       | 6.79   | -10.49 | 27.41  | 0.40   |
|               | 2012       | 2018       | -4.33  | -12.94 | 5.14   | 0.29   |
| Virginia      | 2008       | 2013       | 2.34   | -1.57  | 6.41   | 0.20   |
|               | 2013       | 2018       | -4.70* | -8.34  | -0.91  | 0.02   |
| Washington    | 2008       | 2010       | 6.79   | -5.56  | 20.76  | 0.24   |
|               | 2010       | 2018       | -2.59* | -3.89  | -1.28  | <0.01  |
| West Virginia | 2008       | 2015       | 1.69   | -4.3   | 8.05   | 0.53   |
|               | 2015       | 2018       | -10.13 | -28.39 | 12.79  | 0.29   |
| Wisconsin     | 2008       | 2015       | 3.06*  | 1.49   | 4.65   | <0.01  |
|               | 2015       | 2018       | -2.69  | -8.11  | 3.05   | 0.29   |
| Wyoming       | 2008       | 2016       | -0.99  | -5.86  | 4.13   | 0.65   |
|          | 2016 | 2018 |        |        |        |        |
|----------|------|------|--------|--------|--------|--------|
| APC (Annual Percent Change) in Age Adjusted Mortality Rates. Cells are empty if no data were available. |

*Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05
Table S6. Aortic Stenosis Related Mortality Stratified by State and Sex in the United States, 2008-2018.

| State            | Females |                     | Males     |                     |
|------------------|---------|---------------------|-----------|---------------------|
|                  | Death   | Population          | Crude rate| AAMR                | Death   | Population          | Crude rate| AAMR                |
| Alabama          | 933     | 11,844,702          | 7.9       | 7.3                 | 722     | 10,211,421          | 7.1       | 9.1                 |
| Alaska           | 152     | 1,382,156           | 11        | 16.7                | 134     | 1,463,723           | 9.2       | 19.1                |
| Arizona          | 1,681   | 15,288,108          | 11        | 9.9                 | 1,394   | 13,832,680          | 10.1      | 11.2                |
| Arkansas         | 741     | 7,062,057           | 10.5      | 9.1                 | 578     | 6,257,148           | 9.2       | 11.1                |
| California       | 10,614  | 83,199,489          | 12.8      | 11.3                | 8,549   | 75,007,800          | 11.4      | 14.2                |
| Colorado         | 1,226   | 11,542,066          | 10.6      | 10.6                | 925     | 10,702,019          | 8.6       | 12.5                |
| Connecticut      | 1,574   | 9,230,427           | 17.1      | 12.5                | 966     | 8,015,482           | 12.1      | 13.9                |
| Delaware         | 299     | 2,359,700           | 12.7      | 11.3                | 215     | 2,034,889           | 10.6      | 12.8                |
| District of Columbia | 119   | 1,301,760          | 9.1       | 7.2                 | 86      | 1,094,196           | 7.9       | 9.8                 |
| Florida          | 6,152   | 52,429,018          | 11.7      | 9                   | 5,279   | 46,046,805          | 11.5      | 11.3                |
| Georgia          | 1,582   | 22,066,010          | 7.2       | 7.7                 | 1,157   | 19,173,437          | 6         | 9.3                 |
| Hawaii           | 471     | 3,345,418           | 14.1      | 10.1                | 370     | 3,055,731           | 12.1      | 12.4                |
| Idaho            | 688     | 3,524,297           | 19.5      | 17.7                | 515     | 3,326,541           | 15.5      | 19.5                |
| Illinois         | 3,833   | 29,869,677          | 12.8      | 10.5                | 2,620   | 26,253,610          | 10        | 12.6                |
| Indiana          | 2,217   | 15,358,987          | 14.4      | 12.3                | 1,549   | 13,685,085          | 11.3      | 14.5                |
| Iowa             | 1,715   | 7,458,861           | 23        | 15.6                | 1,145   | 6,754,289           | 17        | 18.6                |
| Kansas           | 1,135   | 6,571,422           | 17.3      | 13.1                | 757     | 5,933,010           | 12.8      | 14.5                |
| Kentucky         | 973     | 10,605,060          | 9.2       | 8.6                 | 736     | 9,401,783           | 7.8       | 10.7                |
| Louisiana        | 999     | 10,601,950          | 9.4       | 9.1                 | 763     | 9,271,986           | 8.2       | 11                  |
| Maine            | 884     | 3,714,139           | 23.8      | 19.6                | 596     | 3,335,145           | 17.9      | 21.6                |
| Maryland         | 1,754   | 14,330,151          | 12.2      | 11.2                | 1,210   | 12,249,124          | 9.9       | 13.2                |
| Massachusetts    | 3,146   | 16,755,289          | 18.8      | 14.2                | 2,069   | 14,453,221          | 14.3      | 17.1                |
| Michigan         | 3,344   | 24,645,035          | 13.6      | 11.3                | 2,513   | 22,002,577          | 11.4      | 14.1                |
| Minnesota        | 2,504   | 12,649,473          | 19.8      | 15.3                | 1,844   | 11,667,570          | 15.8      | 19.2                |
| Mississippi      | 572     | 6,973,847           | 8.2       | 7.7                 | 438     | 5,979,526           | 7.3       | 9.4                 |
| Missouri         | 2,155   | 14,690,232          | 14.7      | 12                  | 1,564   | 12,972,712          | 12.1      | 14.7                |
| Montana          | 441     | 2,528,598           | 17.4      | 14.6                | 372     | 2,404,229           | 15.5      | 18.1                |
| Nebraska         | 886     | 4,245,386           | 20.9      | 14.9                | 570     | 3,867,675           | 14.7      | 16.7                |
| Nevada           | 532     | 6,191,923           | 8.6       | 9.5                 | 460     | 5,967,850           | 7.7       | 10.8                |
| New Hampshire    | 700     | 3,485,057           | 20.1      | 17.7                | 475     | 3,209,975           | 14.8      | 19.8                |
| New Jersey       | 3,779   | 22,098,302          | 17.1      | 13.6                | 2,364   | 19,049,443          | 12.4      | 15.3                |
| State          | Crude Rate | AAMR | Population | Crude Rate | AAMR | Population |
|---------------|------------|------|------------|------------|------|------------|
| New Mexico    | 389        | 4,883,677 | 8          | 7.5        | 363  | 4,388,815   |
| New York      | 6,190      | 47,855,034 | 12.9       | 10.1       | 4,023 | 40,809,243 |
| North Carolina| 3,008      | 23,598,160 | 12.7       | 11.8       | 2,152 | 20,372,072 |
| North Dakota  | 260        | 1,599,349  | 16.3       | 11         | 187   | 1,512,425  |
| Ohio          | 4,286      | 28,854,577 | 14.9       | 12.1       | 3,137 | 25,352,567 |
| Oklahoma      | 893        | 8,775,760  | 10.2       | 9.1        | 656   | 7,855,784  |
| Oregon        | 2,913      | 9,591,034  | 30.4       | 25.3       | 2,077 | 8,719,792  |
| Pennsylvania  | 7,488      | 33,132,629 | 22.6       | 16.2       | 4,650 | 28,940,981 |
| Rhode Island  | 436        | 2,707,595  | 16.1       | 11.1       | 306   | 2,306,845  |
| South Carolina| 1,389      | 11,852,022 | 11.7       | 11.2       | 1,042 | 10,219,781 |
| South Dakota  | 355        | 1,954,751  | 18.2       | 12.9       | 235   | 1,827,727  |
| Tennessee     | 1,798      | 15,771,813 | 11.4       | 10.6       | 1,369 | 13,771,083 |
| Texas         | 4,358      | 53,782,694 | 8.1        | 8.3        | 3,640 | 48,671,824 |
| Utah          | 469        | 4,889,122  | 9.6        | 9.7        | 418   | 4,593,469  |
| Vermont       | 467        | 1,670,267  | 28         | 23.3       | 302   | 1,520,940  |
| Virginia      | 2,272      | 19,301,699 | 11.8       | 11.2       | 1,754 | 17,065,804 |
| Washington    | 3,583      | 16,057,105 | 22.3       | 20.1       | 2,750 | 14,821,645 |
| West Virginia | 584        | 4,879,261  | 12         | 10.3       | 458   | 4,413,562  |
| Wisconsin     | 2,977      | 13,934,494 | 21.4       | 16.6       | 2,047 | 12,831,845 |
| Wyoming       | 168        | 1,290,507  | 13         | 12.4       | 158   | 1,269,517  |

Crude death rates and AAMR (age adjusted mortality rates) are calculated per 100,000 persons.
Table S7. Aortic Stenosis Related Mortality Stratified by State and Race (White and Blacks) in the United States, 2008-2018.

| State            | Whites |          |          |          |          |          |          |          |          |          |
|------------------|--------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                  | Death  | Population | Crude rate | AAMR   | Death  | Population | Crude rate | AAMR   |
| Alabama          | 1,442  | 16,714,244 | 8.6       | 8.7     | 205     | 4,972,571  | 4.1       | 5.1     |
| Alaska           | 221    | 2,186,767  | 10.1      | 17.8    |          |           |           |         |
| Arizona          | 2,973  | 26,158,455 | 11.4      | 10.8    | 25      | 1,021,291  | 2.4       | 3.8     |
| Arkansas         | 1,229  | 11,389,687 | 10.8      | 10.4    | 81      | 1,673,582  | 4.8       | 6.4     |
| California       | 17,403 | 120,664,334 | 14.4     | 14.2    | 620     | 10,325,897 | 6.0       | 7.8     |
| Colorado         | 2,095  | 20,501,255 | 10.2      | 11.8    | 23      | 821,760    | 2.8       | 4.6     |
| Connecticut      | 2,484  | 15,161,778 | 16.4      | 13.8    | 49      | 1,498,073  | 3.3       | 4.8     |
| Delaware         | 469    | 3,448,923  | 13.6      | 12.8    | 43      | 801,930    | 5.4       | 8.0     |
| District of Columbia | 89  | 870,595 | 10.2      | 10.2    | 112     | 1,443,316  | 7.8       | 7.2     |
| Florida          | 10,849 | 83,748,843 | 13.0      | 10.4    | 517     | 11,939,979 | 4.3       | 5.6     |
| Georgia          | 2,363  | 28,526,306 | 8.3       | 9.4     | 361     | 11,230,821 | 3.2       | 4.9     |
| Hawaii           | 266    | 1,944,422  | 13.7      | 15.3    |          |           |           |         |
| Idaho            | 1,187  | 6,628,966  | 17.9      | 18.7    |          |           |           |         |
| Illinois         | 6,061  | 46,016,729 | 13.2      | 12.3    | 330     | 7,346,812  | 4.5       | 5.5     |
| Indiana          | 3,641  | 26,390,868 | 13.8      | 13.6    | 116     | 2,179,728  | 5.3       | 6.6     |
| Iowa             | 2,844  | 13,731,462 | 20.7      | 16.9    | 13      | 265,997    |           |         |
| Kansas           | 1,830  | 11,518,178 | 15.9      | 14      | 42      | 613,929    | 6.8       | 9.2     |
| Kentucky         | 1,648  | 18,452,000 | 8.9       | 9.6     | 54      | 1,316,562  | 4.1       | 5.6     |
| Louisiana        | 1,483  | 13,939,082 | 10.6      | 10.9    | 265     | 5,506,109  | 4.8       | 6.3     |
| Maine            | 1,474  | 6,908,742  | 21.3      | 20.6    |          |           |           |         |
| Maryland         | 2,605  | 17,667,840 | 14.7      | 13.9    | 336     | 7,291,427  | 4.6       | 6.6     |
| Massachusetts    | 5,093  | 27,797,292 | 18.3      | 16.1    | 89      | 1,943,959  | 4.6       | 6.7     |
| Michigan         | 5,565  | 39,893,561 | 13.9      | 13.3    | 251     | 5,505,925  | 4.6       | 5.3     |
| Minnesota        | 4,258  | 22,682,749 | 18.8      | 17.1    | 47      | 791,969    | 5.9       | 12.2    |
| Mississippi      | 832    | 8,735,247  | 9.5       | 9.3     | 176     | 4,053,762  | 4.3       | 5.6     |
| Missouri         | 3,542  | 24,493,388 | 14.5      | 13.6    | 161     | 2,634,538  | 6.1       | 7.9     |
| Montana          | 797    | 4,672,939  | 17.1      | 15.4    |          |           |           |         |
| Nebraska         | 1,435  | 7,654,822  | 18.7      | 16.1    | 14      | 279,090    |           |         |
| Nevada           | 917    | 9,892,298  | 9.3       | 10.9    | 33      | 940,061    | 3.5       | 4.9     |
| New Hampshire    | 1,173  | 6,510,539  | 18        | 18.9    |          |           |           |         |
| New Jersey       | 5,829  | 32,618,916 | 17.9      | 15.6    | 244     | 5,199,384  | 4.7       | 6.3     |
| State          | Population | Crude Death Rate | AAMR | Crude Death Rate | AAMR |
|---------------|------------|------------------|------|------------------|------|
| New Mexico    | 715        | 8,200,201        | 8.7  | 8.8              |      |
| New York      | 9,731      | 67,345,461       | 14.4 | 12.4             | 382  |
| North Carolina| 4,596      | 33,998,283       | 13.5 | 13.9             | 520  |
| North Dakota  | 442        | 2,959,151        | 14.9 | 12               |      |
| Ohio          | 7,081      | 47,662,263       | 14.9 | 14               | 321  |
| Oklahoma      | 1,414      | 14,050,153       | 10.1 | 9.7              | 47   |
| Oregon        | 4,882      | 17,066,988       | 28.6 | 27.1             | 30   |
| Pennsylvania  | 11,733     | 54,988,198       | 21.3 | 17.8             | 367  |
| Rhode Island  | 732        | 4,602,020        | 15.9 | 13.1             |      |
| South Carolina| 2,080      | 16,356,767       | 12.7 | 13.3             | 344  |
| South Dakota  | 575        | 3,524,134        | 16.3 | 13.5             |      |
| Tennessee     | 2,936      | 25,010,476       | 11.7 | 12.3             | 225  |
| Texas         | 7,401      | 85,757,292       | 8.6  | 9.7              | 500  |
| Utah          | 865        | 8,987,994        | 9.6  | 10.7             |      |
| Vermont       | 769        | 3,128,486        | 24.6 | 24.6             |      |
| Virginia      | 3,593      | 27,727,837       | 13   | 13.6             | 394  |
| Washington    | 6,075      | 27,051,023       | 22.5 | 22.8             | 72   |
| West Virginia | 1,019      | 8,941,744        | 11.4 | 11.3             | 21   |
| Wisconsin     | 4,940      | 25,051,942       | 19.7 | 18.2             | 52   |
| Wyoming       | 323        | 2,465,939        | 13.1 | 14.3             |      |

Crude death rates and AAMR (age adjusted mortality rates) are calculated per 100,000 persons. Cells are empty if no data were available.
Table S8. Aortic Stenosis Related Mortality Stratified by State and Race (Asian/Pacific Islander and American Indian/Alaska Native) in the United States, 2008-2018.

| State                  | Asian/Pacific Islander |         | Crude rate | AAMR | American Indian/Alaska Native |         | Crude rate | AAMR |
|------------------------|------------------------|---------|------------|------|-------------------------------|---------|------------|------|
| Alabama                |                        |         |            |      |                               |         |            |      |
| Alaska                 | 50                     | 378,215 | 13.2       | 22.6 |                               |         |            |      |
| Arizona                | 29                     | 847,302 | 3.4        | 5.1  | 48                            | 1,093,740 | 4.4        | 5.7  |
| Arkansas               |                        |         |            |      |                               |         |            |      |
| California             | 1,068                  | 24,881,969 | 4.3   | 4.9  | 72                            | 2,335,089 | 3.1        | 5    |
| Colorado               | 21                     | 624,039 | 3.4        | 5.2  | 12                            | 297,031 | Unreliable |      |
| Connecticut            |                        |         |            |      |                               |         |            |      |
| Delaware               |                        |         |            |      |                               |         |            |      |
| District of Columbia   |                        |         |            |      |                               |         |            |      |
| Florida                | 59                     | 2,379,610 | 2.5   | 3.8  |                               |         |            |      |
| Georgia                | 15                     | 1,320,159 | Unreliable | Unreliable |                     |         |            |      |
| Hawaii                 | 15                     | 1,320,159 | Unreliable | Unreliable |                     |         |            |      |
| Idaho                  |                        |         |            |      |                               |         |            |      |
| Illinois               | 61                     | 2,507,737 | 2.4   | 3.7  |                               |         |            |      |
| Indiana                |                        |         |            |      |                               |         |            |      |
| Iowa                   |                        |         |            |      |                               |         |            |      |
| Kansas                 | 13                     | 125,263 | Unreliable | Unreliable |                     |         |            |      |
| Kentucky               |                        |         |            |      |                               |         |            |      |
| Louisiana              |                        |         |            |      |                               |         |            |      |
| Maine                  |                        |         |            |      |                               |         |            |      |
| Maryland               | 21                     | 1,497,686 | 1.4   | 2.3  |                               |         |            |      |
| Massachusetts          | 30                     | 1,348,548 | 2.2   | 3.4  |                               |         |            |      |
| Michigan               | 18                     | 934,789 | Unreliable | Unreliable |                     |         |            |      |
| Minnesota             | 23                     | 615,308 | 3.7        | 6    | 20                            | 227,017 | 8.8        | 13.3 |
| Mississippi            |                        |         |            |      |                               |         |            |      |
| Missouri               | 12                     | 379,943 | Unreliable | Unreliable |                     |         |            |      |
| Montana                | 14                     | 214,124 | Unreliable | Unreliable |                     |         |            |      |
| Nebraska               | 37                     | 1,152,757 | 3.2   | 5.2  |                               |         |            |      |
| New Hampshire          |                        |         |            |      |                               |         |            |      |
| State         | Code | Population | Crude Death Rate | AAMR | 95% CI Lower | 95% CI Upper |
|--------------|------|------------|------------------|------|--------------|--------------|
| New Jersey   | 68   | 3,142,733  | 2.2              | 3.8  | 30           | 732,695      | 4.1          | 5.6          |
| New Mexico   | 30   | 732,695    | Unreliable       | Unreliable | 5.8          | 10           |
| New York     | 91   | 6,608,142  | 1.4              | 2    | 31           | 534,955      | 5.8          | 10           |
| North Carolina | 13 | 817,694    | Unreliable       | Unreliable | 31           | 534,955      | 5.8          | 10           |
| North Dakota | 18   | 770,114    | Unreliable       | Unreliable | 31           | 534,955      | 5.8          | 10           |
| Oklahoma     | 83   | 1,251,253  | 6.6              | 9.8  | 4.1          | 5.6          |
| Oregon       | 53   | 684,704    | 7.7              | 11.4 | 25           | 271,580      | 9.2          | 17.9         |
| Pennsylvania | 34   | 1,381,709  | 2.5              | 4.8  | 25           | 271,580      | 9.2          | 17.9         |
| Rhode Island |      |            |                  |      |              |              |              |              |
| South Carolina | 35 | 1,919,638  |                  |      |              |              |              |              |
| South Dakota |      |            |                  |      |              |              |              |              |
| Tennessee    |      |            |                  |      |              |              |              |              |
| Texas        | 92   | 4,257,139  | 2.2              | 3.9  | 31           | 534,955      | 5.8          | 10           |
| Utah         | 16   | 285,025    | Unreliable       | Unreliable | 31           | 534,955      | 5.8          | 10           |
| Vermont      | 35   | 1,919,638  | 1.8              | 3.5  | 25           | 271,580      | 9.2          | 17.9         |
| Virginia     | 136  | 2,366,488  | 5.7              | 8.1  |              |              |              |              |
| Washington   | 15   | 359,113    | Unreliable       | Unreliable | 50           | 480,902      | 10.4         | 19.3         |
| West Virginia|      |            |                  |      |              |              |              |              |
| Wisconsin    | 92   | 4,257,139  | 2.2              | 3.9  | 17           | 216,294      | Unreliable   | Unreliable   |
| Wyoming      |      |            |                  |      |              |              |              |              |

Crude death rates and AAMR (age adjusted mortality rates) are calculated per 100,000 persons. Shaded areas suggest absence of deaths recorded. Cells are empty if no data were available. Crude and AAMR were reported unreliable when number of events were too low.
Table S9. Aortic Stenosis Related Mortality Stratified by State and Race (Hispanics) in the United States, 2008-2018.

| State                | Hispanics | Crude rate | AAMR |
|----------------------|-----------|------------|------|
| Alabama              |           |            |      |
| Alaska               |           |            |      |
| Arizona              | 214       | 5,196,734  | 4.1  | 6.5  |
| Arkansas             |           |            |      |
| California           | 2,036     | 40,219,800 | 5.1  | 7.7  |
| Colorado             | 136       | 2,863,397  | 4.7  | 7.3  |
| Connecticut          | 54        | 1,373,343  | 3.9  | 7.3  |
| Delaware             |           |            |      |
| District of Columbia |           |            |      |
| Florida              | 1,042     | 17,635,656 | 5.9  | 6.7  |
| Georgia              | 24        | 1,763,290  | 1.4  | 2.8  |
| Hawaii               | 36        | 307,198    | 11.7 | 19.9 |
| Idaho                | 12        | 396,133    | Unreliable | Unreliable |
| Illinois             | 132       | 5,162,361  | 2.6  | 4.6  |
| Indiana              | 33        | 860,798    | 3.8  | 6.9  |
| Iowa                 | 12        | 313,341    | Unreliable | Unreliable |
| Kansas               | 27        | 657,763    | 4.1  | 7.5  |
| Kentucky             |           |            |      |
| Louisiana            | 21        | 588,202    | 3.6  | 4.4  |
| Maine                |           |            |      |
| Maryland             | 31        | 1,235,627  | 2.5  | 4.9  |
| Massachusetts        | 52        | 1,762,165  | 3    | 5.6  |
| Michigan             | 41        | 1,089,280  | 3.8  | 6    |
| Minnesota            | 16        | 489,258    | Unreliable | Unreliable |
| Mississippi          |           |            |      |
| Missouri             | 11        | 505,369    | Unreliable | Unreliable |
| Montana              |           |            |      |
| Nebraska             | 11        | 354,550    | Unreliable | Unreliable |
| Nevada               | 66        | 1,900,774  | 3.5  | 6.7  |
| New Hampshire        |           |            |      |
| New Jersey           | 199       | 5,096,487  | 3.9  | 6.4  |
| State             | Crude Death Rate | AAMR       | Crude Death Rate | AAMR       |
|------------------|-----------------|------------|-----------------|------------|
| New Mexico       | 179             | 3,421,162  | 5.2             | 6.2        |
| New York         | 335             | 11,496,097 | 2.9             | 4          |
| North Carolina   | 23              | 1,547,909  | 1.5             | 3.2        |
| North Dakota     |                 |            |                 |            |
| Ohio             | 34              | 893,141    | 3.8             | 5.8        |
| Oklahoma         | 11              | 705,143    | Unreliable      | Unreliable |
| Oregon           | 49              | 975,844    | 5               | 10.8       |
| Pennsylvania     | 101             | 1,921,821  | 5.3             | 9.6        |
| Rhode Island     |                 |            |                 |            |
| South Carolina   | 14              | 506,294    | Unreliable      | Unreliable |
| South Dakota     |                 |            |                 |            |
| Tennessee        |                 |            |                 |            |
| Texas            | 1,194           | 27,699,489 | 4.3             | 6.5        |
| Utah             | 29              | 775,162    | 3.7             | 7.2        |
| Vermont          |                 |            |                 |            |
| Virginia         | 37              | 1,600,951  | 2.3             | 5          |
| Washington       | 74              | 1,628,776  | 4.5             | 10         |
| West Virginia    |                 |            |                 |            |
| Wisconsin        | 14              | 702,819    | Unreliable      | Unreliable |
| Wyoming          |                 |            |                 |            |

Crude death rates and AAMR (age adjusted mortality rates) are calculated per 100,000 persons. Shaded areas suggest absence of deaths recorded. Cells are empty if no data were available. Crude and AAMR were reported unreliable when number of events were too low.
Figure S1. Trends in All-Cause Mortality, Cardiovascular Mortality, Cancer Related Mortality and Aortic Stenosis Related Mortality in the United States, 2008-2018.

*Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05. Between 2008 and 2018, following were the age-adjusted death rates for all-cause (2031.6 to 1876.2; AAPC, -0.7 [-1.0, -0.4]), cardiovascular (698.0 to 598.8; AAPC, -1.4 [-1.7, -1.0]), cancer (465.3 to 427.1; AAPC, -0.8 [-1.0, -0.7]), and aortic stenosis (12.7 to 11.5; AAPC, -1.0 [-1.5, -4.1]) mortality.
Figure S2. Trends in Cancer Related Mortality Stratified by Sex in the United States, 2008-2018.

*Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05. Between 2008 and 2018, following were the age-adjusted death rates for women (407.4 to 349.8; AAPC, -1.5 [-1.8, -1.3]) and men (597.7 to 491.20; AAPC, -1.9 [-2.1, -1.7]).
Figure S3. Trends in Cancer Related Mortality Stratified by Race in the United States, 2008-2018.

*Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05. Between 2008 and 2018, following were the age-adjusted death rates for Whites (485.0 to 414.0; AAPC, -1.6 [-2.1, -1.1]), Blacks (572.0 to 463.0; AAPC, -2.1 [-2.3, -1.8]), Hispanics (331.2 to 292.5; AAPC, -1.3 [-1.6, -1.4]), Asians or Pacific Islanders (298.0 to 253.0; AAPC, -1.6 [-2.1, -1.1]), and American Indian or Alaska Native (346.0 to 268.0; AAPC, -2.3 [-3.8, -0.7]).
Figure S4. Trends in Aortic Stenosis Related Mortality Stratified by Age in the United States, 2008-2018.

*Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05. Between 2008 and 2018, following were the crude death rates for 45-54 years (0.60 to 0.60; AAPC, -0.0 [-4.7, 4.9]), 55-64 years (1.60 to 1.60; AAPC, -1.9 [3.0, 0.4]), 65-74 years (5.40 to 5.30; AAPC, -2.1 [1.9, -0.2]), 75-84 years (28.8 to 23.3; AAPC, -2.2 [-2.9, -1.6]), and >85 years (165.2 to 153.5; AAPC, -0.7 [-1.4, 0.0]).
Figure S5. Trends in Aortic Stenosis Related Mortality Stratified by Urban-Rural Classification in the United States, 2008-2018.

**Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05. Between 2008 and 2018, following were the age-adjusted death rates in urban (12.9 to 11.5; AAPC, -1.0 [-1.5, 0.4]) and rural (13.3 to 14.3; AAPC, 0.6 [-0.1, 1.4]) areas.
Figure S6. Trends in Aortic Stenosis Related Mortality Stratified by Place of Death in the United States, 2008-2018.

**Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05. Between 2008 and 2018, following were the absolute number of deaths for medical facility-inpatient (6158 to 6254; AAPC, 0.3 [-0.4, 1.1]), medical facility-outpatient or ER (628 to 623; AAPC, -0.3 [-1.7, 1.0]), home (3348 to 3536; AAPC, -3.1 [2.0, 4.1]), hospice (375 to 1136; AAPC, 12.5 [10.0, 15.0]), nursing home/long-term care (2988 to 3007; AAPC, 0.0 [-0.9, 1.0]), and other (583 to 682; AAPC, -0.7 [3.2, 1.2]).