Table S1. Time periods relating to main data sets used in analyses

| Analysis period | ICD Code | Deaths | Population denominator | Race | Poverty rates | Educational attainment | Deindustrialisation* | Population Change |
|-----------------|----------|--------|------------------------|------|--------------|-----------------------|---------------------|--------------------|
| 1968-1978       | ICD-8    | 1968-1978 | 1968-1978             | 1970 | 1970         | 1970-1980             | 1968-1978           |
| 1979-1988       | ICD-9    | 1979-1988 | 1979-1988             | 1980 | 1980         | 1980-1990             | 1979-1988           |
| 1989-1998       | ICD-9    | 1989-1998 | 1989-1998             | 1990 | 1990         | 1990-2000             | 1989-1998           |
| 1999-2008       | ICD-10   | 1999-2008 | 1999-2008             | 2000 | 2000         | 2000-2010             | 1999-2008           |
| 2009-2016       | ICD-10   | 2009-2016 | 2009-2016             | 2010 | 2012**       | 2010-2016             | 2009-2016           |

*Industrial job losses for the different time periods (change from start year to end year): for the 1970s (1970–1980), 1980s (1980–1990), 1990s (1990-2000), 2000s (2000–2010), 2010s (2010–2016).

**From the American Community Survey 5-year average (2012-2016).
Table S2. - ICD codes used in cause-specific mortality analyses

| Cause                                            | ICD8 codes | ICD9 codes | ICD10 codes |
|--------------------------------------------------|------------|------------|-------------|
| Respiratory disease                              | 460–519    | 460–519    | J00-J99     |
| Ischaemic heart disease                          | 410-414    | 410-414    | I20-I25     |
| Cerebrovascular disease                          | 430-438    | 430-438    | I60-I69     |
| All malignant neoplasms                          | 140-209    | 140-208    | C00-C97     |
| Lung cancer (malignant neoplasm of trachea/bronchus/lung) | 162        | 162        | C33-C34     |
| Intentional self-harm (including events of undetermined intent) | E950-E959, E980-E989 | E950-E959, E980-E989 | X60-X84, Y10-Y34, Y87.0, Y87.2 |
| External causes                                  | E800-E999  | E800-E999  | ICD10 V01-Y98 |
| Motor vehicle traffic accidents (MVTAs)           | E810-E819  | E810-E819  | V02-V04, V09, V12-V14, V19-V79, V86-V89 |
| Alcohol related causes                           | 262,291,303, 571.0, 571.9, E860 | 291, 303, 305.0, 425.5, 571.0-571.5, 571.8, 571.9, E860 | F10, G312, G621, I426, K292, K70, K73, K740-K742, K746-K749, K860, X45, X65, Y15 |
| Drug related poisonings                          | 304, E8530-E8539, E8540-E8549, E8550-E855.6, E8560-E8569, E950, E962, E980 | 304, 305.2-305.9, E850-E858, E950.0-E950.5, E9620, E980.0-E980.5 | F11-F16, F18, F19, X40-X44, X60-X64, X85,Y10-Y14 |

Note that there are overlaps between a number of categories e.g.: all cancers and lung cancer; all external causes, intentional self-harm and drug-related poisonings; external causes and MVTAs
| Ages         | Median (IQR)* | Median (IQR)* | Median (IQR)* | Median (IQR)* | Median (IQR)* |
|--------------|---------------|---------------|---------------|---------------|---------------|
| **Males**    |               |               |               |               |               |
| 0-14 years   | 190 (161-229) | 122 (102-146) | 65 (52-82)    | 54 (42-71)    | 47 (35-65)    |
| 0-64 years   | 526 (463-614) | 412 (356-483) | 350 (296-420) | 322 (264-392) | 320 (263-395) |
| 15-44 years  | 277 (225-344) | 217 (175-269) | 205 (164-259) | 198 (156-252) | 196 (156-247) |
| 45-64 years  | 1,331 (1,180-1,532) | 1,074 (922-1,255) | 904 (767-1088) | 811 (663-987) | 813 (654-1012) |
| 65+ years    | 8,166 (7,660-8,680) | 7,326 (6,857-7,739) | 6,846 (6,363-7,340) | 6,066 (5,571-6,612) | 5,329 (4,856-5,856) |
| All ages     | 1,499 (1,396-1,610) | 1,287 (1,194-1,386) | 1,169 (1,073-1,286) | 1,046 (942-1,169) | 954 (853-1,080) |
| **Females**  |               |               |               |               |               |
| 0-14 years   | 143 (119-174) | 90 (75-112)   | 49 (38-64)    | 42 (32-56)    | 37 (28-52)    |
| 0-64 years   | 260 (230-301) | 211 (186-243) | 192 (166-227) | 189 (156-230) | 197 (156-248) |
| 15-44 years  | 124 (102-154) | 94 (78-115)   | 92 (74-117)   | 102 (79-135)  | 109 (82-143)  |
| 45-64 years  | 640 (555-731) | 559 (487-634) | 524 (454-606) | 497 (408-592) | 514 (409-640) |
| 65+ years    | 5,285 (4,925-5,634) | 4,602 (4,303-4,877) | 4,508 (4,195-4,781) | 4,487 (4,105-4,838) | 4,109 (3,746-4,498) |
| All ages     | 901 (840-970) | 770 (717-824) | 741 (683-799) | 734 (661-810) | 693 (618-779) |
| **Both**     |               |               |               |               |               |
| 0-14 years   | 172 (147-204) | 112 (95-134)  | 61 (50-80)    | 52 (41-69)    | 48 (37-68)    |
| 0-64 years   | 392 (348-453) | 313 (276-362) | 274 (236-325) | 260 (216-314) | 265 (217-325) |
| Age Group | Median (IQR) |
|-----------|--------------|
| 15-44 years | 204 (168-252) | 160 (131-196) | 155 (125-191) | 155 (124-197) | 159 (126-201) |
| 45-64 years | 973 (865-1,105) | 807 (707-925) | 712 (609-838) | 651 (537-785) | 661 (536-822) |
| 65+ years | 6,480 (6,114-6,864) | 5,656 (5,358-5,966) | 5,402 (5,073-5,738) | 5,129 (4,719-5,536) | 4,640 (4,241-5,055) |
| All ages | 1,170 (1,096-1,249) | 993 (925-1,060) | 924 (854-1,002) | 875 (791-969) | 817 (734-919) |

*IQR is the interquartile range, the points between which the middle 50% of the population sit.

Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
Fig. S1. Age-standardised mortality rates by US county, males, 0-64 years, 1968/78 and 2009/16 presented in conventional maps (left) and population-weighted cartograms (right). Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
Fig. S2. Age-standardised mortality rates by US county, males, all ages, 1968/78 and 2009/16 presented in conventional maps (left) and population-weighted cartograms (right). Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
Fig. S3. Age-standardised mortality rates by US county, females, all ages, 1968/78 and 2009/16 presented in conventional maps (left) and population-weighted cartograms (right). Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
Fig. S4. Excess mortality by US county, adjusted for age, poverty and education, females, 0-64 years, 1968/78 to 2009/16.

Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
Fig. S5. Excess mortality by US county, adjusted for age, poverty and education, males, all ages, 1968/78 to 2009/16.

Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
Fig. S6. Excess mortality by US county, adjusted for age, poverty and education, females, all ages, 1968/78 to 2009/16.

Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
### Table S4. Distribution of counties with excess mortality across US States by time period, males 0-64 years.

| State               | Percentage of all counties with excess mortality in each period |
|---------------------|---------------------------------------------------------------|
|                     | 1968-1978 | 1979-1988 | 1989-1998 | 1999-2008 | 2009-2016 |
| Alabama             | 4.9       | 3.4       | 4.3       | 3.8       | 4.4       |
| Alaska              | 0.2       | 0.2       | 0.1       | 0.1       | 0.1       |
| Arizona             | 1.4       | 1.3       | 1.0       | 0.5       | 0.4       |
| Arkansas            | 0.6       | 1.2       | 2.9       | 4.5       | 4.7       |
| California          | 1.5       | 4.2       | 3.3       | 0.6       | 0.6       |
| Colorado            | 1.2       | 1.0       | 1.0       | 0.7       | 1.0       |
| Connecticut         | 0.0       | 0.0       | 0.1       | 0.0       | 0.0       |
| Delaware            | 0.3       | 0.2       | 0.4       | 0.2       | 0.1       |
| District Of Columbia| 0.2       | 0.2       | 0.1       | 0.1       | 0.1       |
| Florida             | 5.4       | 4.7       | 6.0       | 3.7       | 2.1       |
| Georgia             | 13.7      | 10.9      | 9.4       | 9.1       | 5.4       |
| Hawaii              | 0.0       | 0.0       | 0.1       | 0.0       | 0.0       |
| Idaho               | 0.9       | 0.8       | 0.3       | 0.4       | 0.5       |
| Illinois            | 1.4       | 1.2       | 2.3       | 2.9       | 2.7       |
| Indiana             | 2.2       | 2.0       | 1.7       | 4.8       | 4.6       |
| Iowa                | 0.2       | 0.3       | 0.7       | 1.0       | 1.5       |
| Kansas              | 1.4       | 2.2       | 2.4       | 4.5       | 4.9       |
| Kentucky            | 2.2       | 1.5       | 1.0       | 2.7       | 5.7       |
| Louisiana           | 3.1       | 3.5       | 3.4       | 3.1       | 2.9       |
| Maine               | 0.2       | 0.2       | 0.0       | 0.0       | 0.0       |
| Maryland            | 0.9       | 0.5       | 1.4       | 0.8       | 1.0       |
| Massachusetts       | 0.6       | 0.5       | 0.4       | 0.0       | 0.0       |
| Michigan            | 1.7       | 1.7       | 1.0       | 1.5       | 0.8       |
| Minnesota           | 0.0       | 0.0       | 0.0       | 0.0       | 0.3       |
| Mississippi         | 4.8       | 5.9       | 5.9       | 5.1       | 4.1       |
| Missouri            | 1.4       | 1.3       | 1.9       | 3.8       | 4.4       |
| Montana             | 3.4       | 2.7       | 1.3       | 1.4       | 1.3       |
| State            | 0.8 | 1.0 | 1.0 | 1.2 | 1.5 |
|------------------|-----|-----|-----|-----|-----|
| Nebraska         | 2.2 | 2.0 | 1.7 | 1.4 | 0.7 |
| Nevada           | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 |
| New Hampshire    | 0.6 | 1.2 | 1.6 | 0.6 | 0.5 |
| New Jersey       | 1.7 | 1.3 | 0.9 | 0.5 | 0.8 |
| New Mexico       | 1.5 | 1.2 | 1.1 | 0.1 | 0.1 |
| New York         | 7.1 | 6.4 | 7.0 | 4.3 | 1.5 |
| North Carolina   | 0.5 | 0.5 | 0.4 | 0.6 | 0.8 |
| Ohio             | 2.5 | 2.0 | 1.4 | 3.4 | 2.3 |
| Oklahoma         | 1.4 | 3.7 | 4.6 | 5.7 | 6.8 |
| Oregon           | 0.9 | 1.2 | 1.1 | 0.9 | 0.5 |
| Pennsylvania     | 1.9 | 2.0 | 1.7 | 1.3 | 1.9 |
| Rhode Island     | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| South Carolina   | 5.7 | 6.0 | 5.7 | 4.1 | 2.1 |
| South Dakota     | 2.0 | 2.0 | 1.1 | 0.9 | 1.1 |
| Tennessee        | 1.5 | 1.0 | 1.6 | 5.6 | 7.1 |
| Texas            | 3.9 | 6.4 | 6.7 | 7.1 | 8.8 |
| Utah             | 0.8 | 1.0 | 0.4 | 0.8 | 0.7 |
| Vermont          | 0.3 | 0.0 | 0.1 | 0.0 | 0.0 |
| Virginia         | 5.1 | 4.7 | 5.6 | 3.5 | 5.0 |
| Washington       | 0.8 | 0.7 | 0.9 | 0.4 | 0.2 |
| West Virginia    | 2.9 | 2.2 | 1.1 | 1.0 | 2.6 |
| Wisconsin        | 0.3 | 0.2 | 0.4 | 0.9 | 0.3 |
| Wyoming          | 1.9 | 1.7 | 1.1 | 0.7 | 0.7 |
| **Total**        | 100.0 | 100.1 | 100.0 | 100.0 | 100.1 |

*Values above 100% are due to rounding*
Table S5. Distribution of counties with excess mortality across US States by time period, females 0-64 years.

| State                | Percentage of all counties with excess mortality in each period |
|----------------------|---------------------------------------------------------------|
|                      | 1968-1978 | 1979-1988 | 1989-1998 | 1999-2008 | 2009-2016 |
| Alabama              | 3.6       | 2.6       | 3.4       | 3.5       | 3.9       |
| Alaska               | 0.1       | 0.2       | 0.2       | 0.1       | 0.1       |
| Arizona              | 0.9       | 0.8       | 0.5       | 0.4       | 0.2       |
| Arkansas             | 1.6       | 1.7       | 3.1       | 3.5       | 4.6       |
| California           | 3.2       | 4.1       | 2.9       | 1.2       | 0.7       |
| Colorado             | 1.3       | 0.0       | 0.0       | 0.9       | 1.1       |
| Connecticut          | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       |
| Delaware             | 0.3       | 0.5       | 0.5       | 0.3       | 0.1       |
| District Of Columbia | 0.1       | 0.2       | 0.2       | 0.1       | 0.1       |
| Florida              | 4.0       | 4.1       | 4.1       | 3.3       | 2.8       |
| Georgia              | 13.0      | 10.9      | 12.7      | 8.5       | 5.7       |
| Hawaii               | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       |
| Idaho                | 0.9       | 0.8       | 0.9       | 0.4       | 0.7       |
| Illinois             | 1.7       | 2.5       | 1.7       | 3.1       | 3.4       |
| Indiana              | 2.7       | 2.5       | 2.9       | 6.1       | 4.8       |
| Iowa                 | 0.1       | 0.0       | 0.3       | 1.0       | 1.5       |
| Kansas               | 0.9       | 1.2       | 1.9       | 4.6       | 4.7       |
| Kentucky             | 2.0       | 2.5       | 1.2       | 2.7       | 5.6       |
| Louisiana            | 4.0       | 5.3       | 5.0       | 3.4       | 3.3       |
| Maine                | 0.1       | 0.0       | 0.0       | 0.0       | 0.0       |
| Maryland             | 1.6       | 1.5       | 1.5       | 0.7       | 0.6       |
| Massachusetts        | 0.3       | 0.2       | 0.3       | 0.0       | 0.0       |
| Michigan             | 3.3       | 2.3       | 1.5       | 2.1       | 0.7       |
| Minnesota            | 0.0       | 0.0       | 0.2       | 0.1       | 0.2       |
| Mississippi          | 4.3       | 5.6       | 6.4       | 4.8       | 3.9       |
| Missouri             | 1.3       | 2.0       | 1.9       | 3.9       | 5.3       |
| Montana              | 2.5       | 2.3       | 1.2       | 1.4       | 1.6       |
| State            | Nebraska | Nevada | New Hampshire | New Jersey | New Mexico | New York | North Carolina | North Dakota | Oklahoma | Oregon | Pennsylvania | Rhode Island | South Carolina | South Dakota | Tennessee | Texas | Utah | Vermont | Virginia | Washington | West Virginia | Wisconsin | Wyoming | Total |
|------------------|----------|--------|---------------|------------|------------|----------|---------------|--------------|----------|--------|--------------|--------------|----------------|-------------|-----------|-------|------|---------|----------|------------|-------------|----------|---------|-------|
|                  | 0.4      | 2.2    | 0.3           | 1.7        | 1.4        | 3.2      | 5.6           | 0.6          | 0.4     | 0.7    | 2.3         | 0.0          | 5.9            | 1.4         | 1.0       | 4.8   | 0.4   | 0.0     | 4.8      | 1.2        | 2.2         | 0.6      | 1.6    | 1.0   |
|                  | 0.2      | 2.0    | 0.0           | 1.7        | 0.8        | 2.5      | 5.0           | 0.3          | 2.8     | 1.5    | 1.7         | 0.0          | 5.6            | 1.0         | 0.9       | 4.6   | 0.5   | 0.0     | 5.0      | 1.3        | 3.1         | 0.7      | 0.7    | 0.7   |
|                  | 0.9      | 1.7    | 0.0           | 1.7        | 0.0        | 1.9      | 5.2           | 0.7          | 4.8     | 1.9    | 1.4         | 0.0          | 5.5            | 1.4         | 2.5       | 6.2   | 0.5   | 0.0     | 5.2      | 1.3        | 3.1         | 0.3      | 0.3    | 0.3   |
|                  | 1.2      | 1.4    | 0.0           | 0.5        | 0.0        | 0.0      | 3.0           | 0.5          | 0.3     | 1.9    | 0.8         | 0.0          | 2.5            | 0.9         | 5.2       | 7.8   | 0.7   | 0.0     | 0.3      | 0.5        | 2.7         | 0.5      | 1.4    | 1.4   |
|                  | 1.9      | 1.0    | 0.0           | 0.9        | 0.6        | 1.0      | 1.2           | 0.3          | 0.7     | 0.9    | 1.1         | 0.0          | 1.4            | 1.0         | 7.1       | 7.9   | 0.9   | 0.0     | 0.2      | 1.7        | 4.1         | 0.2      | 1.3    | 1.3   |
|                  | 100.0    | 100.1  | 100.0         | 100.0      | 100.0      | 100.0    | 100.0         | 100.0        | 100.0  | 100.0 | 100.0       | 100.0        | 100.0          | 100.0       | 100.0     | 100.0 | 100.0 | 100.0   | 100.0    | 100.0      | 100.0       | 100.0    | 100.0 | 100.0 |

*Values above 100% are due to rounding*
Table S6. Distribution of counties with excess mortality across US States by time period, males, all ages.

| State          | 1968-1978 | 1979-1988 | 1989-1998 | 1999-2008 | 2009-2016 |
|----------------|-----------|-----------|-----------|-----------|-----------|
| Alabama        | 4.1       | 2.5       | 3.4       | 4.3       | 5.2       |
| Alaska         | 0.2       | 0.3       | 0.0       | 0.0       | 0.0       |
| Arizona        | 0.4       | 0.0       | 0.0       | 0.0       | 0.0       |
| Arkansas       | 0.2       | 0.8       | 3.2       | 3.1       | 4.7       |
| California     | 1.1       | 1.4       | 0.5       | 0.0       | 0.1       |
| Colorado       | 0.9       | 0.0       | 0.0       | 0.5       | 0.1       |
| Connecticut    | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       |
| Delaware       | 0.4       | 0.0       | 0.3       | 0.0       | 0.0       |
| District Of Columbia | 0.2 | 0.3 | 0.3 | 0.2 | 0.0 |
| Florida        | 1.1       | 1.7       | 1.6       | 1.2       | 0.6       |
| Georgia        | 14.9      | 13.4      | 11.6      | 11.2      | 6.3       |
| Hawaii         | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       |
| Idaho          | 0.4       | 0.3       | 0.3       | 0.0       | 0.6       |
| Illinois       | 2.6       | 2.0       | 2.6       | 3.6       | 3.6       |
| Indiana        | 3.5       | 3.1       | 3.7       | 5.6       | 6.0       |
| Iowa           | 0.4       | 0.6       | 0.5       | 1.7       | 1.8       |
| Kansas         | 1.3       | 1.1       | 2.6       | 3.8       | 4.6       |
| Kentucky       | 2.2       | 2.5       | 2.6       | 5.1       | 8.2       |
| Louisiana      | 3.5       | 4.5       | 5.5       | 4.1       | 3.3       |
| Maine          | 1.1       | 0.0       | 0.5       | 0.0       | 0.0       |
| Maryland       | 0.9       | 0.8       | 0.5       | 0.8       | 0.4       |
| Massachusetts  | 0.7       | 0.3       | 0.5       | 0.0       | 0.0       |
| Michigan       | 2.2       | 2.0       | 1.1       | 0.7       | 0.3       |
| Minnesota      | 0.0       | 0.0       | 0.0       | 0.2       | 0.6       |
| Mississippi    | 5.8       | 5.9       | 6.3       | 6.6       | 5.6       |
| Missouri       | 2.2       | 1.7       | 1.8       | 3.0       | 3.5       |
| Montana        | 2.6       | 2.0       | 2.1       | 1.2       | 1.0       |
| State            | 2020 | 2021 | 2022 | 2023 | 2024 |
|------------------|------|------|------|------|------|
| Nebraska         | 0.2  | 1.4  | 1.1  | 1.2  | 1.1  |
| Nevada           | 2.4  | 3.4  | 2.1  | 1.5  | 0.7  |
| New Hampshire    | 0.2  | 0.3  | 0.3  | 0.0  | 0.0  |
| New Jersey       | 0.7  | 1.1  | 0.8  | 0.3  | 0.4  |
| New Mexico       | 0.4  | 0.6  | 0.0  | 0.0  | 0.1  |
| New York         | 2.4  | 2.5  | 1.6  | 0.0  | 0.0  |
| North Carolina   | 7.5  | 8.1  | 7.9  | 3.3  | 1.7  |
| North Dakota     | 0.4  | 0.6  | 0.5  | 0.7  | 1.3  |
| Ohio             | 3.7  | 4.8  | 2.9  | 5.6  | 3.2  |
| Oklahoma         | 0.4  | 1.7  | 3.2  | 6.9  | 7.0  |
| Oregon           | 0.7  | 0.3  | 0.5  | 0.2  | 0.1  |
| Pennsylvania     | 3.9  | 3.4  | 2.4  | 1.8  | 2.4  |
| Rhode Island     | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| South Carolina   | 7.1  | 5.3  | 5.3  | 3.3  | 2.1  |
| South Dakota     | 1.9  | 2.2  | 1.6  | 1.2  | 1.1  |
| Tennessee        | 1.3  | 1.4  | 2.1  | 5.5  | 7.5  |
| Texas            | 1.5  | 3.9  | 4.7  | 4.1  | 6.4  |
| Utah             | 0.0  | 0.8  | 0.0  | 0.2  | 0.4  |
| Vermont          | 0.4  | 0.3  | 0.0  | 0.0  | 0.0  |
| Virginia         | 6.5  | 6.2  | 7.4  | 3.6  | 3.8  |
| Washington       | 0.2  | 0.0  | 0.3  | 0.0  | 0.0  |
| West Virginia    | 3.5  | 3.4  | 2.9  | 2.3  | 3.3  |
| Wisconsin        | 0.7  | 0.6  | 0.8  | 0.7  | 0.6  |
| Wyoming          | 1.5  | 1.1  | 0.3  | 0.8  | 0.4  |
| Total            | 100.1| 100.1| 100.0| 100.0| 100.0|

*Values above 100% are due to rounding*
Table S7. Distribution of counties with excess mortality across US States by time period, females, all ages.

| State          | 1968-1978 | 1979-1988 | 1989-1998 | 1999-2008 | 2009-2016 |
|---------------|-----------|-----------|-----------|-----------|-----------|
| Alabama       | 2.4       | 1.4       | 2.4       | 3.8       | 4.9       |
| Alaska        | 0.2       | 0.3       | 0.0       | 0.0       | 0.0       |
| Arizona       | 0.2       | 0.3       | 0.0       | 0.0       | 0.0       |
| Arkansas      | 0.0       | 1.1       | 2.4       | 3.0       | 4.1       |
| California    | 0.7       | 2.6       | 2.1       | 0.6       | 0.0       |
| Colorado      | 0.2       | 0.3       | 0.0       | 0.4       | 0.2       |
| Connecticut   | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       |
| Delaware      | 0.2       | 0.3       | 0.6       | 0.0       | 0.0       |
| District Of Columbia | 0.2 | 0.3 | 0.3 | 0.0 | 0.0 |
| Florida       | 1.2       | 1.1       | 3.0       | 2.1       | 1.1       |
| Georgia       | 9.5       | 7.9       | 10.1      | 10.4      | 6.1       |
| Hawaii        | 0.0       | 0.0       | 0.0       | 0.0       | 0.0       |
| Idaho         | 0.5       | 0.3       | 0.9       | 0.4       | 0.8       |
| Illinois      | 2.1       | 1.7       | 1.5       | 2.8       | 3.3       |
| Indiana       | 5.0       | 4.3       | 5.1       | 5.1       | 5.6       |
| Iowa          | 0.2       | 0.0       | 0.0       | 0.0       | 1.2       |
| Kansas        | 0.5       | 0.9       | 1.2       | 2.6       | 3.6       |
| Kentucky      | 4.3       | 4.3       | 6.3       | 6.8       | 9.9       |
| Louisiana     | 5.4       | 8.5       | 7.1       | 4.3       | 3.3       |
| Maine         | 1.0       | 0.3       | 0.0       | 0.0       | 0.2       |
| Maryland      | 1.0       | 2.0       | 2.4       | 0.8       | 0.8       |
| Massachusetts | 0.5       | 0.6       | 0.3       | 0.0       | 0.0       |
| Michigan      | 4.7       | 2.6       | 1.8       | 1.3       | 0.8       |
| Minnesota     | 0.2       | 0.0       | 0.3       | 0.0       | 0.5       |
| Mississippi   | 6.9       | 4.8       | 3.6       | 5.7       | 4.3       |
| Missouri      | 1.7       | 0.9       | 3.0       | 3.6       | 3.8       |
| Montana       | 1.2       | 2.0       | 1.5       | 1.5       | 1.8       |
| State             | Value1 | Value2 | Value3 | Value4 | Value5 |
|-------------------|--------|--------|--------|--------|--------|
| Nebraska          | 0.5    | 0.0    | 0.3    | 0.6    | 1.2    |
| Nevada            | 2.1    | 2.8    | 1.8    | 1.7    | 0.9    |
| New Hampshire     | 0.2    | 0.0    | 0.0    | 0.0    | 0.0    |
| New Jersey        | 2.1    | 2.8    | 2.1    | 0.4    | 0.2    |
| New Mexico        | 0.5    | 0.0    | 0.0    | 0.0    | 0.2    |
| New York          | 5.2    | 6.2    | 1.5    | 0.2    | 0.2    |
| North Carolina    | 4.3    | 2.6    | 4.8    | 3.2    | 1.4    |
| North Dakota      | 0.5    | 0.3    | 0.3    | 0.4    | 0.9    |
| Ohio              | 7.6    | 6.5    | 5.7    | 5.8    | 3.5    |
| Oklahoma          | 0.5    | 1.4    | 2.4    | 8.3    | 7.1    |
| Oregon            | 0.0    | 0.6    | 0.6    | 0.4    | 0.0    |
| Pennsylvania      | 6.4    | 5.4    | 1.5    | 0.8    | 1.2    |
| Rhode Island      | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| South Carolina    | 6.4    | 4.8    | 3.3    | 1.3    | 0.6    |
| South Dakota      | 1.2    | 1.1    | 0.6    | 0.8    | 0.9    |
| Tennessee         | 1.0    | 1.1    | 1.8    | 4.3    | 7.4    |
| Texas             | 1.4    | 1.7    | 3.9    | 6.8    | 7.1    |
| Utah              | 0.2    | 0.3    | 0.3    | 0.8    | 1.2    |
| Vermont           | 0.0    | 0.3    | 0.3    | 0.2    | 0.0    |
| Virginia          | 4.0    | 7.4    | 7.4    | 3.8    | 4.3    |
| Washington        | 0.0    | 0.3    | 0.3    | 0.2    | 0.0    |
| West Virginia     | 4.3    | 4.8    | 4.5    | 3.6    | 4.6    |
| Wisconsin         | 1.0    | 0.6    | 0.3    | 0.4    | 0.2    |
| Wyoming           | 1.0    | 0.6    | 0.9    | 1.3    | 1.1    |
| Total             | 100.1  | 100.0  | 100.0  | 100.0  | 100.0  |

*Values above 100% are due to rounding*
**Fig. S7.** Contribution of different causes of death in each time period by counties grouped by levels of adjusted mortality: males, 0-64 years. Cause-specific mortality rates are shown as a percentage of all-cause mortality rates. Note different axis scales in chart a and b. Source: *National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)*
Fig. S8. Contribution of different causes of death in each time period by counties grouped by levels of adjusted mortality: females, 0-64 years. Cause-specific mortality rates are shown as a percentage of all-cause mortality rates. Note different axis scales in chart a and b. Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
Fig. S9. Contribution of different causes of death in each time period by counties grouped by levels of adjusted mortality: males, all ages. Cause-specific mortality rates are shown as a percentage of all-cause mortality rates. Note different axis scales in chart a and b. Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
**Fig. S10.** Contribution of different causes of death in each time period by counties grouped by levels of adjusted mortality: females, all ages. Cause-specific mortality rates are shown as a percentage of all-cause mortality rates. Note different axis scales in chart a and b. **Source:** National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
**Fig. S11.** Excess mortality by US county, adjusted for (1) age, poverty and education, (2) age, poverty, education and race and (3) age, poverty, education, race, population change and deindustrialisation, **males, 0-64 years.**

*Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)*
**Fig. S12.** Excess mortality by US county, adjusted for (1) age, poverty and education, (2) age, poverty, education and race and (3) age, poverty, education, race, population change and deindustrialisation, females, 0-64 years.

*Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)*
Fig. S13. Excess mortality by US county, adjusted for (1) age, poverty and education, (2) age, poverty, education and race and (3) age, poverty, education, race, population change and deindustrialisation, males, all ages.

Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-2016)
**Fig. S14.** Excess mortality by US county, adjusted for (1) age, poverty and education, (2) age, poverty, education and race and (3) age, poverty, education, race, population change and deindustrialisation, females all ages.

*Source: National Center for Health Statistics (Compressed Mortality Files 1968-88, 1989-98, 1999-201)*
Table S8: Proportion of counties in very low, low, average, high and very high excess mortality groups for each model over different time periods.

(a) Males: all ages and 0-64 years

| Time Period | Excess Level                     | Males: all ages | Males: 0-64 years |
|-------------|----------------------------------|-----------------|------------------|
|             | Model 1                          | Model 2         | Model 3          | Model 1 | Model 2 | Model 3 |
| 1968-1978   | Lowest (>20% below average)      | 0.9             | 0.5              | 3.8     | 2.0     | 1.9     |
|             | Low (20-10% below average)       | 12.1            | 9.4              | 7.8     | 16.0    | 12.8    | 12.4    |
|             | Average                          | 71.1            | 77.2             | 80.6    | 58.4    | 67.6    | 68.5    |
|             | High (10-20% excess)             | 13.0            | 11.0             | 8.5     | 13.7    | 12.1    | 12.0    |
|             | Highest (>20% excess)            | 2.9             | 1.9              | 2.6     | 8.2     | 5.6     | 5.3     |
| 1979-1988   | Lowest (>20% below average)      | 0.7             | 0.4              | 0.3     | 3.5     | 2.0     | 1.8     |
|             | Low (20-10% below average)       | 8.8             | 7.6              | 7.3     | 13.7    | 12.6    | 12.6    |
|             | Average                          | 78.2            | 81.9             | 82.8    | 62.8    | 69.2    | 69.5    |
|             | High (10-20% excess)             | 10.6            | 7.9              | 7.6     | 13.7    | 11.7    | 11.6    |
|             | Highest (>20% excess)            | 1.7             | 2.1              | 2.0     | 6.4     | 4.5     | 4.5     |
| 1989-1998   | Lowest (>20% below average)      | 1.5             | 1.0              | 0.9     | 5.3     | 3.9     | 3.6     |
|             | Low (20-10% below average)       | 9.3             | 8.6              | 8.0     | 14.5    | 12.9    | 13.5    |
|             | Average                          | 77.0            | 79.1             | 81.1    | 56.8    | 63.1    | 62.7    |
|                         | 1999-2008          |       |       |       |       |       |
|-------------------------|---------------------|-------|-------|-------|-------|-------|
|                         |                    | 1999-2008 |       |       |       |       |
| High (10-20% excess)    | 9.9                | 10.1  | 8.9   | 14.1  | 14.3  | 14.2  |
| Highest (>20% excess)   | 2.4                | 1.1   | 1.2   | 9.3   | 5.8   | 6.0   |
| Lowest (>20% below average) | 4.6            | 3.5   | 3.5   | 8.6   | 8.6   | 8.3   |
| Low (20-10% below average) | 11.4           | 11.5  | 11.2  | 14.4  | 14.3  | 15.0  |
| Average                 | 64.7               | 67.7  | 67.3  | 48.5  | 49.7  | 49.8  |
| High (10-20% excess)    | 15.6               | 14.4  | 15.2  | 18.0  | 17.3  | 15.9  |
| Highest (>20% excess)   | 3.8                | 3.0   | 2.8   | 10.4  | 10.1  | 11.0  |
|                         | 2009-2016          |       |       |       |       |       |
| Lowest (>20% below average) | 6.0             | 5.9   | 5.1   | 10.6  | 11.8  | 11.3  |
| Low (20-10% below average) | 12.2            | 12.2  | 11.9  | 13.9  | 13.5  | 14.1  |
| Average                 | 58.7               | 58.6  | 60.9  | 44.2  | 44.0  | 44.5  |
| High (10-20% excess)    | 17.0               | 17.1  | 16.0  | 16.2  | 14.7  | 15.0  |
| Highest (>20% excess)   | 6.0                | 6.1   | 6.0   | 15.1  | 15.9  | 15.2  |

Model 1: adjusted for age + poverty + education; model 2: adjusted for age + poverty + education + race; model 3: adjusted for age + poverty + education + race + deindustrialization + population change
(b) Females: all ages and 0-64 years

| Time Period | Excess Level               | Females: all ages | Females: 0-64 years |
|-------------|----------------------------|-------------------|---------------------|
| 1968-1978   | Lowest (>20% below average)| 0.6               | 4.1                 |
|             | Low (20-10% below average)| 10.4              | 17.2                |
|             | Average                    | 74.6              | 55.4                |
|             | High (10-20% excess)       | 12.9              | 13.7                |
|             | Highest (>20% excess)      | 1.6               | 9.6                 |
| 1979-1988   | Lowest (>20% below average)| 0.5               | 2.6                 |
|             | Low (20-10% below average)| 8.8               | 15.0                |
|             | Average                    | 78.5              | 62.2                |
|             | High (10-20% excess)       | 10.9              | 15.0                |
|             | Highest (>20% excess)      | 1.3               | 5.3                 |
| 1989-1998   | Lowest (>20% below average)| 1.0               | 2.9                 |
|             | Low (20-10% below average)| 8.7               | 13.3                |
|             | Average                    | 79.5              | 64.3                |
|             | High (10-20% excess)       | 9.7               | 14.1                |
|             | Highest (>20% excess)      | 1.0               | 5.4                 |
|                   | 1999-2008 |       |       |       |       |       |
|-------------------|-----------|-------|-------|-------|-------|-------|
|                   | Lowest (>20% below average) | 3.3   | 2.2   | 2.2   | 5.9   | 5.9   | 5.5   |
|                   | Low (20-10% below average)   | 10.7  | 10.2  | 10.3  | 14.6  | 14.6  | 15.3  |
|                   | Average                        | 69.1  | 72.7  | 72.5  | 54.1  | 55.3  | 55.1  |
|                   | High (10-20% excess)           | 14.4  | 12.4  | 12.3  | 16.3  | 15.0  | 16.0  |
|                   | Highest (>20% excess)          | 2.6   | 2.5   | 2.7   | 9.1   | 9.3   | 8.1   |
|                   | Lowest (>20% below average)    | 5.3   | 4.4   | 4.0   | 10.6  | 11.8  | 10.9  |
|                   | Low (20-10% below average)     | 12.7  | 12.4  | 12.8  | 13.9  | 14.4  | 15.4  |
|                   | Average                        | 61.0  | 61.9  | 62.2  | 44.5  | 43.1  | 44.3  |
|                   | High (10-20% excess)           | 15.6  | 16.2  | 16.0  | 17.3  | 14.6  | 14.0  |
|                   | Highest (>20% excess)          | 5.5   | 5.2   | 5.0   | 13.7  | 16.0  | 15.4  |

*Model 1: adjusted for age + poverty + education; model 2: adjusted for age + poverty + education + race; model 3: adjusted for age + poverty + education + race + deindustrialization + population change*