

Tools of the Trade:

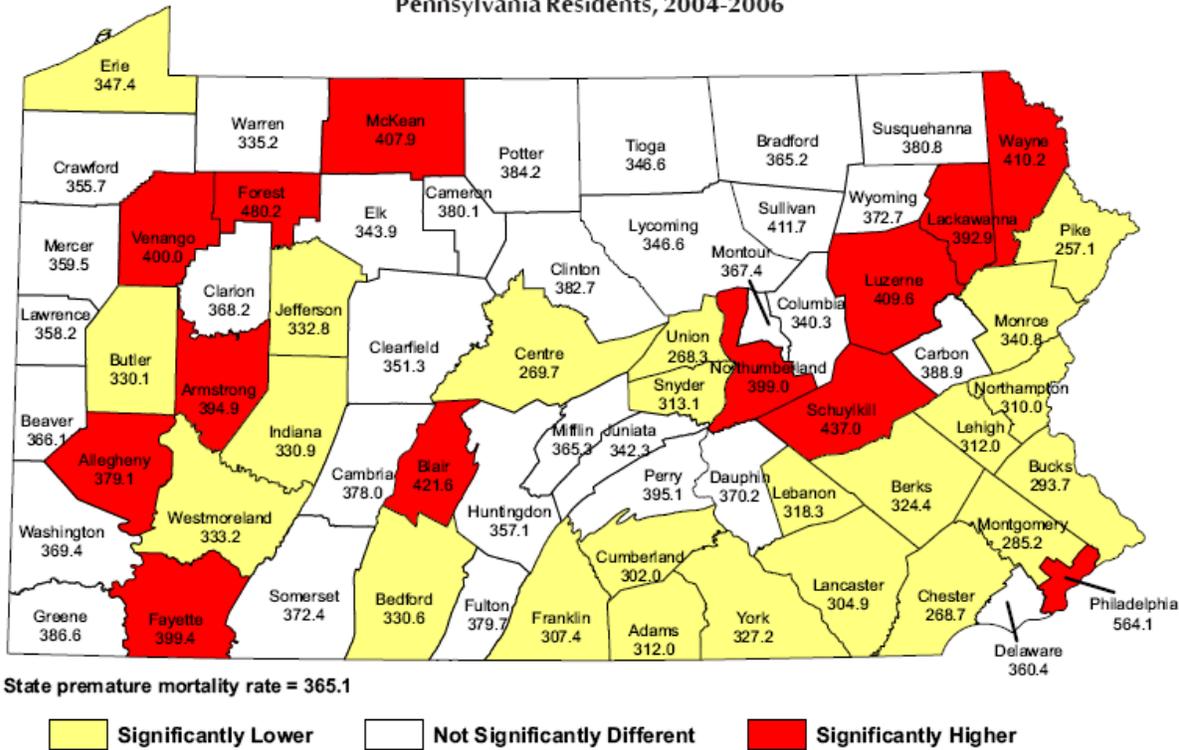
Premature Mortality Rate

Almost 4 out of every 10 deaths to Pennsylvania residents occur to people under 75 years of age. While the quality of life for older Pennsylvania citizens is extremely important, it is also important to investigate deaths to younger citizens as well. The reasoning is that the vast majority of deaths to persons age 75 and older are due to chronic conditions associated with aging, such as cancer. By examining deaths to persons younger than 75, it may be possible to identify geographic areas where certain deaths may be more prevalent among younger residents than other areas. Once recognized, steps may be taken to help reduce the number of deaths occurring in those areas.

One way to go about identifying these areas would be by utilizing premature mortality statistics. The concept of premature mortality is a rather basic one: the number of deaths to residents before age 75. Although this may seem simplistic, it can be a rather helpful calculation in terms of community health analysis when the premature mortality statistic is converted into a rate. The converted rate is called the premature mortality rate (PMR), which is merely the number of deaths to residents under age 75 per 100,000 persons age-adjusted to the 2000 U.S. standard population. (Note: age 75 is used as the cut-off age in this calculation since the life expectancy at birth is slightly over 75 years in the United States).

The PMR is considered a sound summary measure of the impact of death on younger populations. It may also be a more helpful statistic when it comes to assessing certain important public health issues, such as obesity, as opposed to simply using mortality rates. One of the main advantages of using the premature mortality rate is that it moves away from considering single causes or single risk factors to a broader community perspective. But keep in mind that there are some limitations to using the premature mortality rate, such as not being able to identify specific reasons why some areas have a high/low PMR or the fact that summary measures sometimes obscure important subgroup differences.

Map 1
Premature Mortality Rate, Significant Differences by County
Pennsylvania Residents, 2004-2006



Notes: Premature mortality is defined as deaths to residents before age 75. The premature mortality rate (PMR) is the number of deaths to residents under age 75 per 100,000 age-adjusted to the 2000 U.S. standard population.

Map 1 illustrates results of significance testing for the premature mortality rates by county among residents during the years of 2004-2006. It can be seen that most of the counties with significantly higher rates than the state (365.1 per 100,000) were located in the western and northeastern portions of the state, as well as in Philadelphia. The rates that were significantly lower than the state were concentrated mainly in the south central and eastern portions of the state, as well as Erie County. Table 1 (at the end of this article) displays all county premature mortality rates and confidence intervals that correspond to Map 1.

There are three pieces of data that you will need in order to calculate the PMR. They are mortality data, population data and “standard” population data. The following are steps needed to calculate the premature mortality rate. The ensuing example will look at the number of deaths to Allegheny County residents under the age of 75 during the years 2004-2006. The standard population used in the example was the year 2000 United States standard million population age distribution.

We will use a method of adjusting called “direct standardization.” It consists of applying specific crude rates to a standard population. The method serves the purpose of summarizing a set of specific rates independently of the characteristics of the population being studied. (Note: We will use the standard population up to the age group 65-74 for the calculation of premature mortality rates.)

Step 1 –Using the same age groups as the 2000 U.S. standard population distribution (<1, 1-4, 5-14, up to age group 65-74), record the number of deaths to Allegheny residents under the age of 75 for the period 2004-2006.

| Ages | Deaths |
|-------|--------|
| <1 | 294 |
| 1-4 | 44 |
| 5-14 | 59 |
| 15-24 | 385 |
| 25-34 | 481 |
| 35-44 | 1,067 |
| 45-54 | 2,640 |
| 55-64 | 3,937 |
| 65-74 | 6,415 |
| TOTAL | 15,322 |

Step 2 –List the population of Allegheny County residents under the age of 75 for 2004-2006 for each of the age groups.

| Ages | Pop |
|-------|-----------|
| <1 | 38,713 |
| 1-4 | 161,039 |
| 5-14 | 442,149 |
| 15-24 | 505,121 |
| 25-34 | 426,961 |
| 35-44 | 516,469 |
| 45-54 | 558,476 |
| 55-64 | 416,442 |
| 65-74 | 310,068 |
| TOTAL | 3,375,438 |

Step 3 – Compute age-specific rates (crude rates) for each of the age-groups using data from Steps 1 and 2. (Deaths / Pop = Age-Specific Rate).

| Ages | Deaths | Pop | Age-Specific Rate |
|-------|--------|---------|-------------------|
| <1 | 294 | 38,713 | 0.0076 |
| 1-4 | 44 | 161,039 | 0.0003 |
| 5-14 | 59 | 442,149 | 0.0001 |
| 15-24 | 385 | 505,121 | 0.0008 |
| 25-34 | 481 | 426,961 | 0.0011 |
| 35-44 | 1,067 | 516,469 | 0.0021 |
| 45-54 | 2,640 | 558,476 | 0.0047 |
| 55-64 | 3,937 | 416,442 | 0.0095 |
| 65-74 | 6,415 | 310,068 | 0.0207 |

Step 4 – List the “standard” population as the next column in the table. (Remember that the standard used in this example was the 2000 U.S. standard million population distribution by age.)

Step 5 –Multiply each age-specific rate by the corresponding “standard” population. The result is an artificial index displaying the number of deaths each age group would have experienced if the age-specific death rates had actually occurred to the same age group totals found within the "standard" population.

| Ages | Deaths | Pop | Age-Specific Rate | Std Population | Index of Expected Deaths |
|-------|--------|---------|-------------------|----------------|--------------------------|
| <1 | 294 | 38,713 | 0.0076 | 13,818 | 104.9 |
| 1-4 | 44 | 161,039 | 0.0003 | 55,317 | 15.1 |
| 5-14 | 59 | 442,149 | 0.0001 | 145,565 | 19.4 |
| 15-24 | 385 | 505,121 | 0.0008 | 138,647 | 105.7 |
| 25-34 | 481 | 426,961 | 0.0011 | 135,573 | 152.7 |
| 35-44 | 1,067 | 516,469 | 0.0021 | 162,613 | 336.0 |
| 45-54 | 2,640 | 558,476 | 0.0047 | 134,834 | 637.4 |
| 55-64 | 3,937 | 416,442 | 0.0095 | 87,247 | 824.8 |
| 65-74 | 6,415 | 310,068 | 0.0207 | 66,037 | 1,366.2 |

Step 6 – Sum the “standard” population column, as well as the index of expected deaths column.

| Std Population | Index of Expected Deaths |
|----------------|--------------------------|
| 13,818 | 104.9 |
| 55,317 | 15.1 |
| 145,565 | 19.4 |
| 138,647 | 105.7 |
| 135,573 | 152.7 |
| 162,613 | 336.0 |
| 134,834 | 637.4 |
| 87,247 | 824.8 |
| 66,037 | 1,366.2 |
| 939,651 | 3,562.3 |

Step 7 –For the age-adjusted rate, divide the index total by the total “standard” population and multiply that result by 100,000. $(\text{Total expected deaths} / \text{Total “standard” population}) \times 100,000$.

Following Step 7, we would compute the age-adjusted rate by dividing 3,562.3 by 939,651 and then multiplying the result (0.003791) by 100,000. Hence, the premature mortality rate for Allegheny County residents under 75 for 2004- 2006 was 379.1 per 100,000. As seen in Map 1 (page 1) and Table 1 (next page), this rate was significantly higher than the state rate of 365.1.

Table 1
Premature Mortality Numbers, Mortality Rates*, 95% Confidence Bounds and Significance Testing Results
by County, Pennsylvania Residents Less Than 75 Years Old, 2004-2006

| County | Deaths | PMR* | Lower | Upper | County | Deaths | PMR* | Lower | Upper |
|--------------|---------|-------|-------|---------|----------------|--------|-------|-------|---------|
| Pennsylvania | 143,181 | 365.1 | 363.2 | 367.0 | Juniata | 265 | 342.3 | 301.1 | 383.5 |
| Adams | 951 | 312.0 | 292.2 | 331.8 - | Lackawanna | 2,759 | 392.9 | 378.2 | 407.5 + |
| Allegheny | 15,322 | 379.1 | 373.1 | 385.1 + | Lancaster | 4,548 | 304.9 | 296.0 | 313.7 - |
| Armstrong | 961 | 394.9 | 369.9 | 419.8 + | Lawrence | 1,112 | 358.2 | 337.1 | 379.3 |
| Beaver | 2,259 | 366.1 | 351.0 | 381.2 | Lebanon | 1,317 | 318.3 | 301.1 | 335.5 - |
| Bedford | 566 | 330.6 | 303.4 | 357.8 - | Lehigh | 3,269 | 312.0 | 301.3 | 322.7 - |
| Berks | 3,904 | 324.4 | 314.2 | 334.6 - | Luzerne | 4,396 | 409.6 | 397.5 | 421.7 + |
| Blair | 1,787 | 421.6 | 402.1 | 441.2 + | Lycoming | 1,349 | 346.6 | 328.1 | 365.1 |
| Bradford | 779 | 365.2 | 339.6 | 390.9 | McKean | 602 | 407.9 | 375.3 | 440.4 + |
| Bucks | 5,699 | 293.7 | 286.1 | 301.3 - | Mercer | 1,423 | 359.5 | 340.8 | 378.1 |
| Butler | 1,844 | 330.1 | 315.0 | 345.2 - | Mifflin | 574 | 365.3 | 335.4 | 395.1 |
| Cambria | 1,914 | 378.0 | 361.1 | 395.0 | Monroe | 1,679 | 340.8 | 324.5 | 357.1 - |
| Cameron | 75 | 380.1 | 294.0 | 466.1 | Montgomery | 6,920 | 285.2 | 278.5 | 291.9 - |
| Carbon | 835 | 388.9 | 362.5 | 415.3 | Montour | 231 | 367.4 | 320.1 | 414.8 |
| Centre | 948 | 269.7 | 252.6 | 286.9 - | Northampton | 2,779 | 310.0 | 298.4 | 321.5 - |
| Chester | 3,749 | 268.7 | 260.1 | 277.3 - | Northumberland | 1,272 | 399.0 | 377.1 | 420.9 + |
| Clarion | 486 | 368.2 | 335.5 | 401.0 | Perry | 558 | 395.1 | 362.3 | 427.9 |
| Clearfield | 986 | 351.3 | 329.4 | 373.3 | Philadelphia | 23,003 | 564.1 | 556.8 | 571.4 + |
| Clinton | 467 | 382.7 | 348.0 | 417.4 | Pike | 492 | 257.1 | 234.3 | 279.8 - |
| Columbia | 718 | 340.3 | 315.4 | 365.2 | Potter | 233 | 384.2 | 334.9 | 433.5 |
| Crawford | 1,051 | 355.7 | 334.2 | 377.3 | Schuylkill | 2,195 | 437.0 | 418.7 | 455.2 + |
| Cumberland | 2,153 | 302.0 | 289.2 | 314.7 - | Snyder | 368 | 313.1 | 281.1 | 345.1 - |
| Dauphin | 2,955 | 370.2 | 356.8 | 383.5 | Somerset | 1,003 | 372.4 | 349.3 | 395.4 |
| Delaware | 6,052 | 360.4 | 351.3 | 369.4 | Sullivan | 109 | 411.7 | 334.4 | 489.0 |
| Elk | 393 | 343.9 | 309.9 | 377.9 | Susquehanna | 537 | 380.8 | 348.6 | 413.0 |
| Erie | 2,949 | 347.4 | 334.8 | 359.9 - | Tioga | 476 | 346.6 | 315.5 | 377.8 |
| Fayette | 1,980 | 399.4 | 381.8 | 417.0 + | Union | 341 | 268.3 | 239.8 | 296.7 - |
| Forest | 106 | 480.2 | 388.8 | 571.7 + | Venango | 772 | 400.0 | 371.8 | 428.3 + |
| Franklin | 1,403 | 307.4 | 291.3 | 323.5 - | Warren | 498 | 335.2 | 305.8 | 364.7 |
| Fulton | 193 | 379.7 | 326.2 | 433.3 | Washington | 2,595 | 369.4 | 355.2 | 383.7 |
| Greene | 497 | 386.6 | 352.6 | 420.6 | Wayne | 740 | 410.2 | 380.7 | 439.8 + |
| Huntingdon | 542 | 357.1 | 327.1 | 387.2 | Westmoreland | 4,307 | 333.2 | 323.2 | 343.1 - |
| Indiana | 893 | 330.9 | 309.2 | 352.6 - | Wyoming | 338 | 372.7 | 333.0 | 412.4 |
| Jefferson | 526 | 332.8 | 304.3 | 361.2 - | York | 4,178 | 327.2 | 317.3 | 337.2 - |

* Premature mortality rates are computed by the direct method using 2000 U.S. standard million population 0-74 years old. Rates are per 100,000.

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