Technical Notes for Montgomery County Health Department Service Report and Township Health Profile 2004 and 2005

Montgomery County Health Department Township Health Profile and Township Service Reports are a series of 63 individual profiles- one for each township or borough and one for the County. The most recent information available was used. The major data sources are from the Census, PA NEDSS (Pennsylvania's version of the National Electronic Surveillance System), PA death certificate, PA birth certificate, PHMC (Philadelphia Health Management Corporation) health behavior survey, and County Health Department records. The data provided is deemed accurate and reliable but some of the rates may need extremely careful interpretation because of the small numbers used to calculate the rates or percentages.

Data Sources

The basic demographic information is from the U.S. Census Bureau.

The common reportable disease incidences are from the PA NEDSS (Pennsylvania's Version of the National Electronic Surveillance System) and the reporting dates were used for determining the incidence year. Only confirmed cases were used in the report. Human animal bite incidence is from the department's own data source. Animal owner's address information was used to determine the case jurisdiction. Animal bite incidence includes all cases where the animal was owned by a Montgomery county resident and the incident happened in the county. Data from the 2004 population was used to calculate the incidence rate.

The cancer incidence information is from the PA Department of Health Cancer Registry. The incidence reported includes all Montgomery County residents diagnosed with invasive cancer within Pennsylvania hospitals and excludes those solo-diagnosed in VA hospitals. The 2000 United States 18 group standard million population was used for the age-adjusted cancer incidence rate. Detail age group information can be found at http://seer.cancer.gov/stdpopulations/.

Natality data is extracted from the PA birth certificate data received from PA DOH vital statistics registration. Only births of Montgomery County residents were included in the report. Births which occurred in Montgomery County but

were of other county's residents were excluded from the report. The 2002 population is used for the birth rate and fertility rate calculation.

Mortality data is extracted from the PA birth certificate data received from PA DOH vital statistics registration. Only deaths of Montgomery County residents were included in the report. Deaths which occurred in Montgomery County but were of other county's residents were excluded from the report. The 2002 population is used for the death rate calculation.

Health Behavior Risk Factor Data is extracted from the 2004 PHMC (Philadelphia Health Management Corporation) survey.

Definitions of Terms

INCIDENCE - Number of new cases of a disease diagnosed each year.

INCIDENCE RATE - Number of new cases per year per 100,000 persons.

CRUDE BIRTH RATE - Number of live births per 1,000 of the population.
(Total Live Births / Total Population) x 1000

GENERAL FERTILITY RATE - Number of live births per 1,000 females of childbearing age (between the ages of 15 and 44 years).
(Total Live Births / Female Population Aged 15-44 Years) x 1000
(In preparing this report we have noticed that some births happened to women aged 45 and over, but the 14 to 44 age group population was used for the childbearing age female population)

AGE-SPECIFIC BIRTH RATE - Number of live births to mothers in a specified age group per 1,000 females in the same age group.
(Live Births to Mothers of Specified Ages / Female Population of Same Specified Population) x 1000

CRUDE DEATH RATE - Number of deaths per 100,000 of the population. The crude death rate represents the average chance of dying during a specified period for persons in the entire population.
(Total Deaths / Total Population) x 100,000

AGE-SPECIFIC DEATH RATE – number of deaths per 100,000 of the population in a specified age group, such as 1–4 years or 5–9 years for a specified period.

CAUSE-SPECIFIC DEATH RATE - Number of deaths due to a specific cause per 100,000 of the population.
(Deaths Due to a Specified Cause / Total Population) x 100,000

INFANT DEATH RATE - Deaths among infants under one year of age per 1,000 live births.
(Total Deaths Among Infants Under One Year of Age / Total Live Births) x 1000

LOW BIRTH WEIGHT - Babies that weigh 5 1/2 pounds (2,500 grams) or less at birth. Low birth weight infants are of two different types: those who are born too small because they are born too soon, and those who are born on time, but are too small for their gestational age.

FIRST TRIMESTER - The period of time from the first day of the last menstrual period through 12 weeks of gestation. It is during this period that the embryo undergoes most of its early structural development. Most miscarriages occur during this period.

AGE-ADJUSTED RATE - Age-adjusted rate is a weighted average of the age-specific (crude) rates, where the weights are the proportions of persons in the corresponding age groups of a standard million population. The potential confounding effect of age is reduced when comparing age-adjusted rates computed using the same standard million population. Several sets of standard populations can be used for age-adjusted rate calculation. These include the total US population (1940, 1950, 1960, 1970, 1980, 1990, and 2000), the 1991 Canadian population, the European population, and the world population.

CONFIDENCE INTERVAL (CI) -A measure of the precision of an estimated value. The interval represents the range of values, consistent with the data that is believed to encompass the "true" value with high probability (usually 95%). The confidence interval is expressed in the same units as the estimate. Wider intervals indicate lower precision; narrow intervals indicate greater precision.

ICD-10 - The International Classification of Disease Code.

Important notes for this report:

Basic demographic information was extracted from the US Census website. Race and Hispanic ethnicity are mutually exclusive from each other, this means one person could be any one of the race and be either Hispanic ethnicity or not.

Common reportable diseases were extracted from PA NEDSS. It reported all confirmed diseases at the time of analysis. Due to the investigation process, naturally, some of the cases may not be confirmed at the time of analysis but later may become a confirmed case. Therefore, 2004 and 2005 case numbers may be lower than the actual case numbers.

Regarding the natality and mortality data, it must be kept in mind that absolute counts of events (as provided in this report) do not readily lend themselves to analysis and comparison between years and between various geographic areas because of population differences. These demographic differences include total number, age and sex distribution, and ethnic or racial differentials. In order to assess the health status of a particular population at a specified time, the absolute number of events is converted to a relative number such as a probability of living or dying, i.e., a rate, a ratio, or an index. This conversion is made by relating the number of events to the population at risk in a particular area at a specified time. Also, all the rates calculated in this report are an annual average of three, five or seven years of data.

A crude death rate is a ratio of deaths during a year applied to the total mid-year population, e.g. 6.95 heart disease deaths per 1000 population in 2002. However, populations used to compute rates often vary considerably according to age, race, sex and other demographic factors. Therefore, if a measurement of mortality that can be used either to compare different populations (states, counties, cities, townships, etc.) or to compare the mortality experience over time for one area with a changing population is required, it is advisable to adjust or standardize the effects of such factors as age and/or sex in these groups.

Death or incidence rates can be adjusted for any demographic factor, such as race or any combination of factors, such as age, sex and race. The most commonly used adjustment is for age. Age-adjusted rates are commonly used in comparative mortality analyses since age is such a prime factor in mortality, especially with chronic diseases such as heart disease and diabetes.

For example, townships with higher percentages of older residents will almost always have much higher crude death rates for all deaths as well as for major chronic conditions, compared to townships with younger populations. Conversely, townships with younger populations will tend to have higher crude rates for deaths due to unintentional injuries, especially motor vehicle crashes. Age-adjusted death rates eliminate the bias of age in the makeup of the populations being compared, thereby providing a much more reliable rate for comparison purposes.

Leading cause of death is based on the crude number of deaths for the particular category. For example, in the 25 to 44 age category, if there are 5 accident deaths, 6 suicide deaths, 7 cancer deaths and 3 diseases of the heart deaths, the ranking will be cancer followed by suicide, accident, then diseases of the heart. In this report, because we are dealing with smaller numbers, some of the rankings may not be reliable if the cause of death has equal numbers. In this case, random selection was used.

PHMC survey data percentages may not be reliable because of the smaller sample size interviews in some of the townships. Some of the townships may see high percentages on their report due to the small sample size interviewed. For example, if 5 people were asked if they smoke and 4 of them said yes, then there will be 80% response rate. That means even one small number change will make a huge percentage change. In order for legitimate comparison, confidence intervals should be used. But confidence intervals should not be used if the total interview cases are less than 10.

Reliability of Rates

All rates are subject to variation. This variation is directly related to the number of events used to calculate the rate. The smaller the number of events used in the calculation of a rate, the higher the variability of the rate will be. Rates (or percentages) based on unusually small numbers of events over a specified period of time or for a sparsely populated geographic area should be of particular concern and used cautiously. When few events or small populations are evident in calculating/studying rates, multiple-year summary rates, usually referred to as average annual rates, will sometimes provide a much better perspective or measurement of an outcome. Expanding the period of time studied enlarges the absolute numbers and adds more credence to a statement regarding a rate.

It is also a common practice among data users familiar with health statistics to calculate what is called a standard error (SE) of a rate when comparing rates. This statistic defines a rate's variability and can be used to calculate a confidence interval (CI) to determine the range of possible values for the true rate. If a set standard, goal or target value is included in a rate's confidence interval, there is no significant difference between the two. However, there are various statistical formulas for comparing rates depending on the types of rates or populations being studied and the number of events involved.

Comparison of Age-Adjusted Rates

The first step in comparing rates is the computation of a standard error (SE), defining the rate's variability. The usual formula given for computing the standard error of an age-adjusted rate (Chiang, 1961) is very complex and not often understood or used by the average health data user. However, the average user can approximate the standard error of an age-adjusted rate with the following less complex formula (Keyfitz, 1966):

$$SE = (R / \sqrt{N})$$

where:

R = (age-adjusted) rate
N = number of events (deaths)

This estimate assumes the rate to be a binomial proportion. As an example, use the state's average annual (2001-2003) age-adjusted death rate for suicide of 10.4 to calculate an estimated SE. The rate was based on 3,922 suicides. The square root of 3,922 is 62.63. By dividing the rate of 10.4 by 62.63, one obtains the estimated SE of 0.1661. The estimated SE can then be used to compute a 95% confidence interval (CI) for the rate. The standard formula for determining the 95% CI of a rate is:

$$R \pm (1.96 \times SE)$$

Following this formula, for the rate used, this produces an equation of $10.4 \pm (1.96 \times 0.1661)$ and the result is 10.4 ± 0.33. Then, by subtracting and adding 0.33 against the original rate of 10.4, a range can be calculated and considered the estimated 95% confidence interval for the state, i.e., 10.07 - 10.73. One

could then state, with 95% certainty that the actual age-adjusted suicide rate for the state during 2001-2003 was between 10.07 and 10.73.

To compare a particular county's age-adjusted suicide rate for 2001-2003 with the state's corresponding rate, one must go through the same steps shown directly above to obtain the 95% CI for that county's rate. If the rate for the state is not included in the CI, then the county rate is considered to be significantly different, at the 95% confidence level.

For example, at first glance, Montgomery County's age-adjusted suicide rate for 2001-2003 of 16.0 (based on 23 deaths) seems much higher than the corresponding state rate of 10.4. However, calculation of a 95% CI for Montgomery County's rate would produce a rather wide range of 9.46-22.54. Since this range for Montgomery County also includes 10.4 or the state rate, we can say that the county rate is not significantly different than the state rate, at the 95% confidence level.

If comparing two counties, any significant difference would be determined by whether or not the confidence intervals overlapped. However, please note that the formula for computation of the SE that was used is not as precise as others and the application of a more precise methodology may produce somewhat different results. Another important result the user of this formula should note is that, the smaller the number of events, upon which the rate is based, the larger the SE and CI will be. This clearly demonstrates the wider variability (and less reliability) of rates based on smaller numbers. As a general rule, age-adjusted rates based on less than twenty events should be considered unstable and are not recommended for comparative use or in determining significance.

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