

A. SOURCES OF DATA

1. Births, Deaths and Fetal Deaths:

Birth, death and fetal death certificates are the source documents for data on vital events to Pennsylvania residents. Births and deaths to Pennsylvania residents that occurred in another state are included in this report. There is an agreement among all registration areas in the United States for exchange of copies of certificates. Birth and fetal death certificates are usually completed by hospital personnel present at the facility. Death certificates are usually completed by hospital personnel, physicians, funeral directors, coroners and medical examiners.

Beginning with the reporting of 2003 live births, Pennsylvania implemented the latest revision of the U.S. Standard Certificate of Live Birth. Some items on the certificate were added or changed from previous years. Please see section "F. 2003 Revisions to Certificate of Live Birth" for more details on this important change.

Also, beginning in 2006, the collection and reporting of death and fetal death data was performed using revised certificates. These revisions were based upon changes made by the Centers for Disease Control and Prevention. Please refer to section "G. 2006 Revisions to Certificates of Death and Fetal Death" for more details.

2. Induced Abortions:

Information contained in this report on induced terminations of pregnancy or abortions were obtained from the source document, *Report of Induced Termination of Pregnancy*, as required to be completed and submitted by facilities registered to perform such procedures in the Commonwealth according to the Abortion Control Act of 1982, as amended.

Induced abortions to Pennsylvania residents which occurred in another state are not included in this report. Pennsylvania has no interstate agreement with the other registration areas in the United States for exchange of such information. Collection of induced abortion data varies widely from state to state.

3. Population:

State or county population estimates as of July 1 for the intercensal years of 2021-2022, 2011-2019, 2001-2009, 1991-1999, and 1981-1989, which are presented and/or used in this report to compute rates, were produced jointly by the United States Bureau of the

Census and the Pennsylvania State Data Center of the Pennsylvania State University at Harrisburg under the Federal-State Cooperative Program for Local Population Estimates. These estimates are published by the Bureau of the Census in *Current Population Reports, Series P-25*. Subcounty (city, borough, and township) population estimates for intercensal years are calculated by the Bureau of the Census using a housing unit method, in which the change in the number of housing units at the subcounty level is used to distribute the county population to subcounty areas. All population data for Census years (2010, 2000, 1990, 1980, etc.) presented and/or used in this report are U.S. Bureau of Census enumerated population figures as of April 1 of the Census year.

Population data by race and Hispanic origin for 2021-2022, 2011-2019, 2001-2009, 1991-1999, and 1981-1989 were also produced by the Pennsylvania State Data Center. Racial and Hispanic origin population data for 2000 and 2010 are Bureau of the Census enumerated figures. The 1981-1989 black population figures used to compute the rates that appear in this report were derived from 1980 and 1990 Census data. They were estimated by advancing 1980 Census data incrementally to finally match 1990 Census figures.

Respondents to the 2010 Census were able to select multiple races for racial designation. However, state population data by race, as shown and used in this report, did not include figures for multiple-race categories until 2013. Please see Section J "Multi-Race Designation" for more details on this change. Birth, death, and fetal death statistics are available for multiple-race categories beginning with 2013 data. Therefore, population estimates were calculated as single-race categories and were used to calculate all rates by race that appear in this report prior to 2013 data.

Among Pennsylvania residents, only 1.9 percent selected multiple races on the 2010 Census form. The National Center for Health Statistics (NCHS), which is responsible for releasing national vital statistics, has produced, in collaboration with the U.S. Bureau of the Census, revised population estimates (starting with 2000) by race that "bridged" multiple-race data into single-race categories.

We have included those revised U.S. figures in this report. Please note that, unless otherwise noted, the original population estimates for non-census years were used for the computation of multiple-year average annual rates.

B. DATA QUALITY

1. Query and Field Programs:

The quality of birth and death data presented in this report is directly related to the completeness and accuracy of the information reported on certificates. The Department of Health works to ensure that the information received is as complete and accurate as possible, and it maintains two major program operations to improve the quality of information reported on birth and death certificates – query and field programs.

The query program is a system used to follow-up with hospital personnel, funeral directors and/or physicians concerning incomplete or conflicting information reported on the certificate. The follow-up contact is usually done by telephone and is based on both manual and computer editing procedures.

The field program attempts to improve birth, death and fetal death certificate information by educating the participants in the vital registration system, i.e., hospital personnel, funeral directors, physicians, etc., of the uses and importance of vital statistics data. The field program completes this mission by conducting seminars with various associations representing the types of individuals listed above.

In addition to regularly scheduled seminars, the field representatives make site visits when problems with registration relating to a particular area or institution are discovered.

NCHS monitors Pennsylvania's coding of statistical data on death certificates. A 0.5 percent sample of death records coded and submitted monthly by the state is used as a quality control mechanism by NCHS. The National Center for Health Statistics codes these sample records independently, and then conducts an item-by-item computer match of codes entered by the state and the National Center. NCHS has established a two percent upper limit for coding difference involving any one data item of these sample records, with the exception of cause of death. A 5.0 percent limit is established for that item, due to the complexity of the cause of death coding process.

2. Fetal Deaths:

The reporting of deaths and live births is considered to be nearly complete (99 percent or greater). However, in Pennsylvania, spontaneous fetal deaths under sixteen weeks gestation are not required to be reported.

According to a study of the estimated number of total pregnancies for the United States, prepared by the National Center for Health Statistics, the 2008 percentage distribution of live births, fetal deaths and

induced abortions is as indicated in the following table. The percent distribution of Pennsylvania's reported pregnancies for 2019 is also shown for comparison.

It is apparent that there are a very large number of fetal deaths not reported or included in this publication, mainly due to the exclusion of those fetal deaths under sixteen weeks gestation.

	United States Estimated Pregnancies 2008	Pennsylvania Reported Pregnancies 2019
Live Births	64.6%	81.8%
Fetal Deaths	17.0%	0.7%
Induced Abortions	18.4%	17.5%

Note: May not sum to 100 due to rounding.

3. Induced Abortions:

The quality of induced abortion data presented in this report is directly related to the completeness and accuracy of the information contained on induced termination of pregnancy reporting forms. The Division of Health Informatics edits and queries reported abortion data to ensure that the information received is as complete and accurate as possible.

It is important to note that Pennsylvania has no agreement with any other states for the exchange of induced abortion information, and many states do not collect similar data. Therefore, induced abortions to Pennsylvania residents which occurred in another state are not included in this report.

4. Reported Pregnancies:

It should be noted by the users of this report that the term “reported pregnancies” as used in this publication includes three major data sources – live births, fetal deaths and induced abortions – as required by law to be reported to the Pennsylvania Department of Health. Data on induced abortions do not include those procedures obtained by Pennsylvania residents outside the Commonwealth. Please also see section A on Data Sources and previous parts of this section B on Data Quality for more information on the three data components (resident live births, fetal deaths and induced abortions) that are used to compute the reported pregnancy statistics that appear in this annual report.

5. Congenital Anomalies/Birth Defects:

When reviewing statistics on congenital anomalies reported at the time of birth in this publication, please

note that historical and recent studies have verified the underreporting of congenital anomalies on birth certificates, especially for defects that are not easily diagnosed at the time of birth.

Beginning with the reporting of 2003 live births, Pennsylvania implemented the latest revision of the U.S. Standard Certificate of Live Birth. Additional choices for specific types of congenital anomalies have been added to both the Down syndrome and suspected chromosomal disorder options to gather greater detailed information. However, many of the types of congenital anomalies previously collected have been deleted from the certificate, including the "other anomalies" category. Therefore, Pennsylvania data on "total congenital anomalies" can no longer be included in this report. These changes reflect the fact that many types of anomalies are not easily diagnosed soon after birth. Therefore, incomplete or inaccurate reporting on the birth certificate occurs. Please see section "F. 2003 Revisions to Certificate of Live Birth" for more details on this important change.

C. GEOGRAPHY

1. Allocation:

In Pennsylvania's vital records registration program, events are classified geographically in two ways. The first way is by place of occurrence, i.e., the actual state and county where the event took place. The second, and more customary way, is by place of residence, i.e., the state, county and minor civil division reported to be the usual residence of the decedent at the time of death, or of the mother in the case of a newborn. Fetal deaths and infant deaths, in cases where the infant was never discharged from the hospital, are to be assigned the residence of the mother.

While occurrence figures are accurate and have both administrative value and some statistical significance, residence data are far more useful in determining public health indices for planning and evaluation purposes. The natality, reported pregnancy and mortality statistics in this report are residence data; however, the induced abortion data shown in this report include both residence and occurrence data. Statewide induced abortion statistics for the years 1975-1988 are available as occurrence data only. This is due to the fact that the source document (*Induced Abortions: Quarterly Report*) used to collect that information from 1975 through September, 1988 requested aggregated quarterly occurrence data. Therefore, both occurrence and residence data are presented for statewide induced

abortion data.

Allocation of vital events by place of residence is sometimes difficult, because classification depends entirely on the statement of the usual place of residence furnished by the informant at the time the original certificate was completed. For various reasons, this statement may be incorrect or incomplete. For example, mailing address often differs from the actual geographic residence. Where the mailing address is a rural delivery number, it may be impossible to allocate the event to a specific township or minor civil division, if this information is not supplied. How often incorrect information regarding residence is reported is not known, but it is generally due to lack of information about the exact location of residence or misunderstanding of the question on the part of the informant. This problem is applicable generally only to minor civil division level data. Resident counts for the state are usually very accurate. County resident figures are substantially correct and can be used with a high degree of confidence.

2. Criteria for Municipality Selection:

Tables A-6, B-33, B-34, B-35, B-36, B-37, B-38, B-39, B-40, C-35, C-36, C-37, C-38, C-39, C-40, C-41, and C-42 show statistics for 28 selected municipalities. These municipalities include cities or boroughs with a 2020 U.S. Bureau of the Census enumerated population of 20,000 or more. Philadelphia is both a city and a county and, therefore, is included in both county and municipality tables.

D. DEFINITIONS OF TERMS

1. Natality:

BIRTH WEIGHT – The first weight of the fetus or newborn obtained after birth. This weight should be measured preferably within the first hour of delivery, before significant postnatal weight loss has occurred.

LOW BIRTH WEIGHT – A birth weight under 2,500 grams or 5 pounds and 9 ounces.

VERY LOW BIRTH WEIGHT – A birth weight under 1,500 grams or 3 pounds and 5 ounces.

LIVE BIRTH – According to Pennsylvania law, is the expulsion or extraction from its mother of a product of conception, irrespective of the period of gestation, which shows any evidence of life at any moment after

such expulsion or extraction.

LIVE BIRTH ORDER – A term used to indicate the numeric relationship of a child to others live-born to that mother.

2. Mortality:

CAUSE OF DEATH – Deaths by cause are classified according to the International Classification of Diseases (ICD) of the World Health Organization. In this report, the underlying cause of death is used to classify the cause. The underlying cause of death is either the disease or injury which initiated the train of events leading directly to death or the circumstances of the accident or violence which produced the fatal injury. Please see section "H. Underlying Causes of Death" for further discussion on cause-of-death coding and reporting.

FETAL DEATH – Defined by law in Pennsylvania as the expulsion or extraction from its mother of a product of conception after 16 weeks gestation, which shows no evidence of life after such expulsion or extraction.

INFANT DEATH – Death of an infant under 1 year of age.

NEONATAL DEATH – An infant death occurring within the first 27 days of life.

POSTNEONATAL DEATH – An infant death occurring at one month (28 days) to 364 days of age.

MATERNAL DEATH – The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

MEDIAN AGE – The age that falls exactly in the middle of the entire range of ages ranked in order from low to high such that 50 percent of the ages fall above it and 50 percent fall below it. If the number of ages is even, a value halfway between the two ages nearest the middle is used.

PREMATURE MORTALITY – 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 Standard population.

3. Induced Abortions:

INDUCED ABORTION – An induced abortion or induced termination of pregnancy is the purposeful interruption of pregnancy with the intention other than to produce a live-born infant or to remove a dead fetus and which does not result in a live birth.

4. Reported Pregnancies:

REPORTED PREGNANCY – Data on reported pregnancies are aggregated live births, fetal deaths, and induced abortions, as required by various Pennsylvania laws (see above definitions) to be reported to the Department of Health.

OUTCOME – The clinical result of a reportable pregnancy, i.e., a live birth, fetal death or induced abortion.

5. Birth Weight in Grams:

To provide data comparable to that published for the United States and other countries, birth weight is reported in grams. However, not all facilities in Pennsylvania record birth weight in grams and, in order to collect complete data, providers are given the opportunity to report either pounds/ounces or grams on the Pennsylvania Certificate of Live Birth. Birth weights reported in pounds/ounces are converted to grams. The equivalents of the gram intervals in pounds and ounces are as follows:

Grams	Pounds and Ounces
499 or less	1 lb. 1 oz. or less
500 – 999	1 lb. 2 oz. – 2 lb. 3 oz.
1,000 – 1,499	2 lb. 4 oz. – 3 lb. 4 oz.
1,500 – 1,999	3 lb. 5 oz. – 4 lb. 6 oz.
2,000 – 2,499	4 lb. 7 oz. – 5 lb. 8 oz.
2,500 – 2,999	5 lb. 9 oz. – 6 lb. 9 oz.
3,000 – 3,499	6 lb. 10 oz. – 7 lb. 11 oz.
3,500 – 3,999	7 lb. 12 oz. – 8 lb. 12 oz.
4,000 – 4,499	8 lb. 13 oz. – 9 lb. 14 oz.
4,500 – 4,999	9 lb. 15 oz. – 11 lb. 0 oz.
5,000 or more	11 lb. 1 oz. or more

6. Body Mass Index (BMI):

The body mass index (BMI) calculation for adults used in this publication follows the formula and weight status categories adopted by the Centers for Disease Control and Prevention (CDC). The formula for BMI

calculation, as used for this publication is shown below:

$$BMI = \frac{Weight(lb)}{[Height(in)]^2} \times 703$$

The standard weight categories associated with BMI ranges for adults are displayed below:

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and above	Obese

7. Geographic Allocation:

RESIDENT DATA – Compiled per usual residence regardless of the geographical place where the event occurred. For births, fetal deaths and infant deaths (if the newborn was never discharged from the hospital), the mother's usual residence is used as the place of residence.

OCCURRENCE DATA – Data compiled as to the geographical place the event occurred without regard to the actual residence.

E. RATES

Absolute counts of births and deaths do not readily lend themselves to analysis and comparison between years or between various geographic areas because of population differences. These demographic differences include total number, age and sex distributions 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 crude number of events to the living population at risk in a particular area at a specific time. All of the rates defined here are computed for a period covering one year, except for the average annual rates which are based upon five-year summary data.

1. Definitions of Rates:

CRUDE BIRTH RATE:

$$\frac{Total\ Live\ Births}{Total\ Population} \times 1,000$$

AGE-SPECIFIC BIRTH RATE:

$$\frac{Live\ Births\ to\ Mothers\ of\ Specified\ Ages}{Female\ Pop.\ of\ Same\ Specified\ Ages} \times 1,000$$

GENERAL FERTILITY RATE:

$$\frac{Total\ Live\ Births}{Female\ Population\ Aged\ 15\ to\ 44\ Years} \times 1,000$$

FETAL MORTALITY RATE:

$$\frac{Total\ Fetal\ Deaths}{(Total\ Live\ Births + Total\ Fetal\ Deaths)} \times 1,000$$

NEONATAL MORTALITY RATE*:

$$\frac{Infant\ Deaths\ Aged\ < 28\ Days}{Total\ Live\ Births} \times 1,000$$

POSTNEONATAL MORTALITY RATE*:

$$\frac{Infant\ Deaths\ Aged\ 28 - 364\ Days}{Total\ Live\ Births} \times 1,000$$

INFANT MORTALITY RATE*:

$$\frac{Total\ Infant\ Deaths}{Total\ Live\ Births} \times 1,000$$

CRUDE DEATH RATE:

$$\frac{Total\ Deaths}{Total\ Population} \times 1,000$$

AGE-SPECIFIC DEATH RATE:

$$\frac{Deaths\ for\ Specified\ Age\ Group}{Population\ of\ Same\ Specified\ Age\ Group} \times 1,000$$

RACE OR ETHNICITY SPECIFIC DEATH RATE:

$$\frac{Deaths\ for\ Specified\ Race\ or\ Ethnicity}{Population\ for\ Same\ Specified\ Group} \times 1,000$$

AGE-ADJUSTED DEATH RATE (Direct Method):

$$\frac{Sum\ of\ (age\ specific\ death\ rates\ per\ 100,000\ for\ selected\ population \times standard\ population\ in\ corresponding\ age\ groups)}{Sum\ of\ standard\ population}$$

*For infant, neonatal and postneonatal mortality rates by race and Hispanic origin, the race or Hispanic origin of the infant is used to classify deaths and the race or Hispanic origin of the mother is used to classify live births.

Age-specific death rates (per 100,000) for a selected population are applied to a standard population (in this report the 2000 United States standard million population was used) of the same age groups. The sum of these calculations is then divided by the total of the standard population and yields the age-adjusted death rate per 100,000. (It is important to use the same standard population in the computation of each age-adjusted rate to allow comparability among age-adjusted rates. Age-adjusted rates are artificial measurements and should never be compared with any other type of rate or be used to calculate the actual number of events.) The 2000 United States standard million population and age distributions used in calculating age-adjusted death rates for this report are shown below:

All Ages	1,000,000
Under 1.....	13,818
1-4	55,317
5-14	145,565
15-24	138,646
25-34	135,573
35-44	162,613
45-54	134,834
55-64	87,247
65-74	66,037
75-84	44,842
85+	15,508

WARNING: *Pennsylvania Vital Statistics 1999* was the first annual report of vital statistics to use the 2000 standard million population in the calculation of all age-adjusted mortality rates. Therefore, age-adjusted rates that appeared in reports prior to 1999 (using the 1940 or other standard million population) are not comparable to the age-adjusted mortality rates that appear in this report and the 1999 report, including historical rates. The U.S. Department of Health and Human Services adopted the newer 2000 standard million population as the only population standard for age-adjustment, starting with 1999 events. Please note that use of a more recent population distribution for the standard in age-adjustment results in rates that more accurately reflect the average risk of death associated with an aging population. Also, age-adjusted rates that are calculated using the 2000 population standard will be higher than those calculated using the 1940 standard and more closely match crude rates which reflect the actual age distribution of a population.

PREMATURE MORTALITY RATE:

$$\frac{\text{Sum of (age specific death rates under age 75} \times \text{standard population in corresponding age groups)}}{\text{Sum of Standard Population under 75}} \times 100,000$$

CAUSE-SPECIFIC DEATH RATE:

$$\frac{\text{Deaths Due to a Specified cause}}{\text{Total Population}} \times 100,000$$

MATERNAL MORTALITY RATE:

$$\frac{\text{Total Maternal Deaths}}{\text{Total Live Births}} \times 100,000$$

TOTAL FERTILITY RATE:

$$\text{(Sum of Age Specific Birth Rates Among Women for 5 Year Age Groups Between 10 and 49 *)} \times 5$$

The sum of the age-specific birth rates of women in five-year age groups multiplied by five is the total fertility rate. This rate estimates the number of children a cohort of 1,000 women would bear if they all went through their childbearing years exposed to the age-specific birth rates in effect for a particular time. The total fertility rate, or TFR, can be used as an estimate of the fertility growth factor in a population, e.g. whether the childbearing population is replacing itself or not. A TFR of 2,000 or above indicates that, on the average, couples are producing at least two children to replace themselves. When the TFR exceeds 2,000 for an extended period, the next generation of childbearing age will probably be larger than the present population of that age, if all other factors affecting the population, such as death rates and migration, remain constant. Pennsylvania's TFR has been under 2,000 since 1972. However, it has remained relatively stable since then, although still below replacement level. The TFR is not meant to be used as an absolute measure of population trends, but can be helpful in understanding and analyzing them. There are many other factors to consider when determining population trends, such as crude birth rates, death rates and migration patterns. It would take several generations of a childbearing population maintaining a replacement level to just stabilize a specific population, again given that other factors, mainly age-specific death rates, also were maintained.

REPORTED PREGNANCY RATE:

*Births to mothers under 15 are included in the 10-14 age group and births to mothers 45 and older are included in the 45-49 age group.

$$\frac{(\text{Total Live Births} + \text{Fetal Deaths} + \text{Induced Abortions})}{\text{Female Population Ages 15 to 44}} \times 1,000$$

AGE-SPECIFIC REPORTED PREGNANCY RATE:

$$\frac{(\text{Live Births} + \text{Fetal Deaths} + \text{Induced Abortions}) \text{ for Females of Specified Ages}}{\text{Female Population for Same Specified Ages}} \times 1,000$$

AVERAGE ANNUAL RATE:

$$\frac{\text{Total Number of Events for a Specified Multiple Year Period}}{\text{Total Population for Same Specified Multiple Year Period}} \times 1,000$$

2. Reliability of Rates:

Rates (or percentages) based on 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.

As an example of the various problems involved with the reliability of rates, we will use the infant mortality rate in 2019 for Bedford County. There were only two infant deaths reported in 2019 among residents of Bedford County, a rather sparsely populated rural county. Unfortunately, these two deaths could be enough to give Bedford County an infant mortality rate that would appear to be higher than most counties in the state. This is the chance result of a few deaths having enormous significance when statistically applied to the number of births among the residents of that county. Any statement regarding this high infant mortality rate in Bedford County could be quite misleading. When small numbers of events (generally less than 10) are involved in calculating or reviewing rates, multiple-year rates (usually five or ten-year average annual rates) will sometimes provide a much better perspective or measurement of an outcome. For this reason, all rates or percentages that involve small numbers (less than 10 unless otherwise noted) have been suppressed and are not displayed in this report. As an alternative, expanding the period of time studied enlarges the absolute numbers and adds more credence to a statement regarding Bedford County's infant mortality rate. Expanding the area of study can also help with small numbers.

There are many characteristics of a population that can also render a crude rate of little use. Any unique

demographic factors such as those related to age, sex and race may not be accounted for in crude rates. One prime Pennsylvania example is Centre County. Because Penn State's major campus with over 40,000 students is located in this rural county, the median age is usually the lowest in the state; so is the crude death rate. However, rates can be adjusted or calculated to more specific groups within a population. When all county rates are adjusted for age, Centre County usually appears closer to the middle of these rates. Age, sex or race adjusted and specific rates can offer a more refined measurement to compare vital event experiences over geographic areas or time periods. However, there are limitations to their use (see definition of age-adjusted rate in Section E.1.) and one should be very familiar with these rates before attempting their use.

3. Variability of Rates:

Standard Errors and Confidence Intervals

All rates are subject to random 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 will be the variability of the rate.

It is common practice among statisticians and data users familiar with health statistics to calculate a standard error (SE) of a rate when studying or comparing rates. This statistic defines a rate's variability and can be used to calculate a confidence interval (CI) to determine the actual variance of a rate 95 percent of the time.

The standard error (SE) for a cause or age-specific or adjusted rate per 100,000 population can be estimated* by dividing that rate by the square root of the number of events (N) upon which the rate was based:

$$\frac{\text{RATE}}{\sqrt{N}}$$

This standard error estimate assumes the rate to be a binomial proportion. It was used to calculate the standard errors for the 95 percent confidence intervals that appear in this report.

As an example, let's use Pennsylvania's 2019 age-adjusted heart disease death rate of 172.7 per 100,000 population in the calculation of this estimated S.E. and 95 percent C.I. The rate of 172.7 was based on 32,250 resident heart disease deaths reported for 2019. The square root of 32,250 is 179.58. By dividing the rate of 172.7 by 179.58, one obtains the estimated S.E. of 0.96.

This estimated S.E. can then be used to compute a

*Keyfitz N. Sampling Variance of Standardized Mortality Rates, Human Biology, 38: 309-317, 1966.

95 percent CI for the rate. The standard formula for determining the 95 percent CI of a rate is:

$$RATE \pm (1.96 \times S.E.)$$

Following this formula, for the rate we are using, produces an equation of $172.7 \pm (1.96 \times 0.96)$ and the result is 172.7 ± 1.9 . Then, by subtracting and adding 1.9 against the original rate of 172.7, a range can be calculated and considered the estimated 95 percent confidence interval for the rate, i.e., 170.8 – 174.6. One could then state, with 95 percent certainty that the actual 2019 age-adjusted heart disease death rate for the state was between 170.8 and 174.6.

The above formulas were used for calculating the confidence intervals that appear in this report. There are various statistical formulas for comparing rates, depending on the types of rates or populations being studied and the number of events involved. If you are not familiar with the use of these statistical applications, we recommend review of publications addressing these issues and/or consultation with a statistician or other professional familiar with analyzing/comparing health statistics before pursuing any further study of the rates that appear in this report.

In addition, we recommend that users disregard age-adjusted rates based on less than 20 events and any other rates based on less than ten events. The standard errors and confidence intervals for these rates are usually "very large" and, therefore, not reliable, especially for any comparative analysis. Thus, these rates have been suppressed and denoted as "ND" in the report.

NOTE: For more detailed information and assistance on computing and using reliable rates/statistics for analysis, please go to the Division of Health Informatics web pages at <https://www.health.pa.gov/topics/HealthStatistics/Pages/health-statistics.aspx> and select Statistical Resources.

F. 2003 REVISIONS TO CERTIFICATE OF LIVE BIRTH

1. Background

Beginning with the reporting of 2003 live births, Pennsylvania implemented the latest revision of the U.S. Standard Certificate of Live Birth. The standard certificates have been the principal means for achieving the uniformity in information upon which national vital

statistics are based. To ensure that the standard certificates and reports meet current data needs, it is essential that they be reviewed and revised periodically. This revision came about as a result of an extensive evaluation process initiated by NCHS. NCHS achieved this by assembling a panel of expert consultants to evaluate the 1989 Standard Certificate and to recommend revisions.

While most data items on the certificate are comparable to past years, certain items have been changed or removed, which will cause discontinuity in some birth trend data. Many of the changes were made to the medical portion of the document. Specifically, revisions were made to the Medical Risk Factors, Obstetric Procedures, Complications of Labor and/or Delivery, Method of Delivery, Abnormal Conditions of the Newborn and Congenital Anomalies sections. In some cases, the section names were changed, and a number of check box items were added, deleted or amended, as appropriate, to elicit more specific and/or attainable information.

In addition, items were added to the certificate to address data collection needs and facilitate the linkage of data sets. Questions were also added to collect information on maternal morbidity, mother's height and weight, WIC participation, principal source of payment for delivery, infections present and breastfeeding status. All of the changes listed are anticipated to lead to improvements in the quality of birth data.

Please note that not all states have implemented the use of the new birth certificate format. Therefore, items which were added or significantly revised in the 2003 revisions will most likely not have information provided for Pennsylvania residents who gave birth in another state. These unknown data will appear in residence data but not occurrence data.

2. Overview of Revised or New Data Items

Height and weight of the mother. The 2003 certificate collected data on the mother's height for the first time. Previously, it only asked for the weight gained by the mother during pregnancy. Now, the mother's pre-pregnancy weight and weight at delivery are collected.

Race of the mother and the father. The race items were revised from an open-ended question to a check box format which allows multiple races to be reported. The certificate used by Pennsylvania was also revised to

collect self-designated single race data. For this report, the multiple race data was utilized. Also, consistent with national guidelines, birth records prior to 2003 with write-ins of Hispanic for race were coded to white. Starting in 2003, these records were coded as other.

Prenatal care visits. In previous years, the mother or prenatal care provider reported the month of pregnancy in which the mother began prenatal care. As of 2003, this item was replaced by the exact dates of first and last prenatal visit. Therefore, the month prenatal care began is now calculated from the last normal menses date and the date of first prenatal care visit.

Tobacco use. This item was revised to collect the average number of cigarettes smoked per day during the three months before pregnancy and by trimester (first three months, second three months, and last three months) during pregnancy. Prior to 2003, a simple yes/no question ("Tobacco use during pregnancy?") and average number of cigarettes smoked per day (throughout the pregnancy) were asked.

Risk factors. The 2003 certificate gathers this information in greater detail by asking when diabetes was diagnosed (pre-pregnancy or gestational). Additional information on whether the pregnancy was assisted by reproduction technology (i.e. pregnancy resulted from infertility treatment) is also collected.

Method of delivery. Several new questions are asked including the fetal presentation at birth, whether a delivery with forceps or vacuum extraction was attempted but unsuccessful, and whether a trial of labor was attempted. This section was revised so that the provider reports only the final route and method of delivery.

Obstetric procedures. New choices have been added including the success or failure of an external cephalic version.

Abnormal conditions of the newborn. The selections within this portion of the certificate have been revised to include information on neonatal intensive care unit (NICU) admission, significant birth injury, and antibiotics received by the newborn for suspected neonatal sepsis.

Congenital anomalies of the newborn. Many of the anomalies previously listed, including an "other anomalies" category, are no longer collected. Additional choices have been added to both the Down syndrome and suspected chromosomal disorder options to gather

greater detail.

Education. Prior to 2003, the mother was asked to report the highest grade completed. The 2003 certificate includes a series of check boxes to report the highest level of education completed at the time of delivery. The check boxes include degrees completed rather than years of schooling.

New data items. Other new data items collected on the 2003 certificate not previously mentioned in this section include:

- Infections during pregnancy
- Infant being breastfed
- Principal source of payment for delivery
- Maternal morbidity
- WIC food received

G. 2006 REVISIONS TO CERTIFICATES OF DEATH AND FETAL DEATH

1. Background

Starting in 2006, Pennsylvania implemented the latest revisions of the U.S. Standard Certificate of Death and Certificate of Fetal Death. Following an evaluation process initiated by NCHS, revisions were made to both certificates. As mentioned previously, the standard certificates have been the principal means for achieving the uniformity in information upon which national vital statistics are based.

Three new data items were added to the Certificate of Death, allowing previous data to still be comparable. The three questions added pertained to tobacco use contributing to death, whether the decedent was pregnant at the time of death, and the type of transportation injury death, if a transportation-related injury death occurred.

While most data items on the Certificate of Fetal Death are comparable to past years, certain items have been changed or removed which will cause discontinuity in some fetal death trend data. Many of the changes made were to questions concerning the mother. Specifically, revisions were made to the Cause/Conditions Contributing to the Fetal Death, Medical Risk Factors, Complications of Labor and/or Delivery, Method of Delivery and Congenital Anomalies sections. In some cases, the section names

were changed, and a number of check box items were added, such as those for race of the mother or mother's education.

H. UNDERLYING CAUSES OF DEATH

1. Implementation of ICD-10

Starting with the reporting of 1999 deaths, the International Classification of Diseases (ICD) system for mortality adopted the new Tenth Revision or ICD-10 coding structure and rules for determining and classifying underlying causes of death. ICD-10 replaces ICD-9, which was first used for 1979 events. The first ICD was created in 1900 and was usually revised every ten years after that. It is developed by the World Health Organization (WHO) in collaboration with ten international centers, one of which is the National Center for Health Statistics (NCHS), to promote international comparability for presentation and analysis of mortality statistics. All states, in order to insure universal comparability, have followed international and national standards and implemented use of ICD-10 in 1999.

The change from ICD-9 to ICD-10 (the first revision in twenty years) has affected the reporting of leading causes of death, thereby creating major discontinuities in mortality trend data.

The rationale for the periodic revisions to the ICD system has been to reflect advances in medical science and changes in diagnostic terminology. Some major differences between ICD-10 and ICD-9 include the following:

- ICD-10 is far more detailed than ICD-9; about 8,000 categories compared with 4,000.
- ICD-10 uses 4-digit alphanumeric codes compared with 4-digit numeric codes used in ICD-9.
- Cause-of-death titles have been changed and medical conditions have been regrouped.
- Some coding or classification rules have been changed.

Due to the adoption of ICD-10, some major causes of death are not entirely comparable to those coded under ICD-9. Some simply have a name change, but include the same conditions. Also, please note that, starting with 2001 deaths, new ICD-10 codes for Terrorism Deaths were added (U01.0-U03.9).

2. Comparability Ratios (ICD 10 vs. ICD 9)

As stated above, the new ICD revisions for determining and classifying underlying causes of death resulted in major discontinuities when comparing causes from previous years. To assist the public health community in understanding the discontinuities caused by adoption of ICD-10, NCHS double-coded all United States deaths (2.3 million) for 1996 according to ICD-9 and ICD-10 standards. This allowed NCHS to produce comparability ratios from the two coded data sets by dividing the number of deaths for a selected cause classified under ICD-10 by the number of deaths classified to the most nearly comparable cause of death under ICD-9. The resulting ratio represents the net effect of the revision on the counts for this cause and can be used to explain changes in numbers and rates. Please contact the Division of Health Informatics for a list of these ratios by cause of death. Additional information on ICD-9 and ICD-10 comparability issues can be found on the NCHS web site at www.cdc.gov/nchs/icd.htm.

Most causes have a comparability ratio close to 1.0, which represents a near perfect match. However, several causes do have somewhat higher or lower ratios, most notably "Influenza and Pneumonia" and "Alzheimer's Disease." The high/low ratios for those two causes are directly due to the changes in the coding rules for classifying underlying cause of death under ICD-10.

Pneumonia is most often the consequence of another condition or injury, and ICD-10 allows for a much broader range of conditions, of which pneumonia can be considered a consequence. As a result, pneumonia is much less likely to be selected as an underlying cause of death under ICD-10 than under ICD-9. The opposite is true of Alzheimer's disease, which is now much more likely to be determined as an underlying cause of death under ICD-10.

I. MULTIPLE CAUSES OF DEATH

Traditionally, aggregate mortality statistics have been based on a tabulation of deaths, with one underlying cause assigned for each death. However, the medical certifier is required to report on a death certificate the immediate cause of death, the antecedent conditions which gave rise to the immediate cause, the underlying cause and any other significant conditions contributing to death that are not related to any previously stated causes on the death certificate. An ever increasing demand for more comprehensive mortality data, coupled with advances in computer technology, resulted in the development of the Automated Classification of Medical Entities (ACME) system by

NCHS.

The principal objective of this system is to provide full medical information from death certificates by assigning the traditional underlying cause, as well as tabulating multiple causes from all medical conditions listed on the certificates by the certifier, through automated application of the internationally recognized classification of diseases. The result is multiple cause data made available on computer tape by means of a system of computer programs furnished by NCHS.

The multiple causes of death information are coded to computer files in two formats: record axis and entity axis. Entity codes identify the conditions causing or contributing to death, together with their position as they were entered in the cause of death section of the death certificate. Record axis codes, on the other hand, reflect the application of a uniform set of rules to the entity codes in order to eliminate redundancies and internal inconsistencies and to substitute the preferred codes for a given combination of conditions. Use of the entity codes is necessary to study the temporal and causal relationships among the conditions associated with a given set of deaths. Use of the record axis codes, however, is necessary if the conditions associated with death are to be aggregated and tabulated on a uniform basis.

Please contact the Division of Health Informatics if you are interested in more information about multiple causes of death statistics.

J. MULTI-RACE DESIGNATION

Starting in 2013, race was derived from multiple race selections. Prior to 2013, race was derived from a single race designation field. For example, starting in 2013, a count in “White” means that it was the only race selected from a list of multiple race selections. Prior to 2013, “White” meant that the single race designation was “White” alone. For 2013 and forward, a new race designation of “Multi-Race” was assigned to people that chose more than one race out of the possible selections. As an example, “White” and “Black” chosen together would yield “Multi-Race” as the race designation. However, if only one race was chosen in this example, the person would be designated as either “White” only or “Black” only depending on their selection.