

VI. Definitions and Formulas

Caution:

Any percentage or rate with a small number of events in the numerator will have substantial random variation over time. A rule of thumb is that any percentage or rate with fewer than 50 events in the numerator may be subject to serious random error.

Therefore, many of the percentages and rates in this volume should be interpreted with caution.

Births and deaths are exhibited in the tables of this report by frequencies and rates. The term “rate” usually means the number of vital events in a given period of time divided by the average number of people at risk during that period. In this report, the average number of people at risk is usually the midyear population, the period is one year or five years and the rate is expressed per 1,000 population. For example, the formula for a single-year birth rate is

$$\frac{B}{P} \times 1,000$$

where B is the number of births in the year and P is the midyear population. Similarly, the formula for a five-year birth rate is

$$\frac{B_1 + B_2 + B_3 + B_4 + B_5}{P_1 + P_2 + P_3 + P_4 + P_5} \times 1,000$$

where B₁, B₂, etc. are the numbers of births in the particular years and P₁, P₂, etc. are the midyear populations in those years.

The term rate is also used in this report to mean a simple proportion expressed per 100 or per 1,000. These rates are the ratio of two related vital event counts. An example of this type of rate is the single-year infant mortality rate. The formula is

$$\frac{D}{B} \times 1,000$$

where D represents deaths of infants during a year and B represents live births during the same year. Another example is the low birthweight rate which is the ratio

of low birthweight births to total births expressed as a percentage.

$$\frac{LBW}{B} \times 100$$

Rates are rounded to one decimal place for publication. Except for marriages and divorces for which race-specific rates are not calculated. If both the numerator and denominator are zero, “n/a” is shown for the rate. A rate of 0.0 is shown for rates less than 0.05.

Inaccurate reporting, under-registration and missing values have been discussed (Section V). These factors affect the validity of information involved in rate computation. The users of vital statistics measures should be aware of these possible limitations.

Furthermore, readers should cautiously interpret rates that are based on small frequencies since they may be associated with relatively large chance fluctuation. For this reason, five-year rates are included. Based on an increased number of events, these average annual rates are more stable than the single-year rates.

In comparing rates, consider carefully the factors to which a difference in rates might be attributed. Unless the populations are equivalent in all factors except the one for which the comparison is made, conclusions about differences in rates may not be clearly drawn. Age-adjusted rates or other further analyses may be necessary in order to make valid comparisons.

Definitions and formulas are given in the numerical order of their appearance in the tables. Except for items 9 and 18–20, rates are for resident events.

Definitions

1. **Population** is the expected population of an area as of July 1 of the event year. Figures shown in the tables of this report are summations over age-race/ethnicity-sex-specific estimates produced by the Population Estimates Program of the U.S. Census Bureau in collaboration with the National Center for Health Statistics.
2. **Natural Increase** is the excess of births over deaths among residents of an area.
3. A **Live Birth** is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or any definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached (definition adopted by World Health Organization in 1950).
4. **Attendant** is a physician (M.D. or D.O.) in a hospital, a physician not in a hospital, a Certified Nurse-Midwife (CNM) or other attendant. Legislation during 1983 (G.S. 90-178) regulates the practices of CNMs; these practitioners must have certification by the American College of Nurse-Midwives.
5. **Place of Delivery** is where the infant was born—in a hospital, at home (intended or not intended), or other (which includes a clinic, a physician’s office, or a freestanding birth center).
6. **Low Birthweight** includes liveborn infants weighing under 2,500 grams (5 pounds, 8 ounces or less) at birth, regardless of the period of gestation. (Birthweight index recommended by the Expert Group on Prematurity of the World Health Organization, 1950).
7. **Birth to Unmarried Mother** is birth to a woman who has never been legally married or who has been widowed or legally divorced from her husband in excess of 280 days.⁴
8. **Mother Smoked** is based on birth certificate reporting that the mother used tobacco during the pregnancy.
9. **C-Section** indicates that the method of delivery was either a primary or a repeat Cesarean section.
10. An **Occurrence Birth** is a birth that occurs in North Carolina regardless of the place of residence. Live births occurring in an area to residents of the area are also shown in the tables. Complementary totals, i.e., nonresident births occurring in the area and resident births occurring elsewhere, may be obtained by subtraction.
11. **Perinatal Deaths** are the sum of registered fetal deaths and neonatal deaths (see definitions below).
12. **Fetal Death** is death prior to the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy, as indicated by the fact that after such expulsion or extraction the fetus does not breathe or show any evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles (definition adopted by World Health Organization in 1950). Consistent with North Carolina law, this report includes only fetal deaths which do not qualify as therapeutic abortions and which result from pregnancies of 20 or more weeks gestation (see Section IV).
13. **Neonatal Death** is death of a liveborn infant under 28 days of age.
14. **Postneonatal Death** is death of a liveborn infant age 28 days and over but less than one year of age.
15. **Infant Death** is defined as death of a liveborn infant under one year of age.
16. **Death** is defined as the permanent disappearance of any evidence of life at any time after live birth.⁵ Also, North Carolina law (G.S. 90-322) defines criteria for certifying “brain death.”

17. **Age at Death** is reported age in completed years as of the last birthday. Errors in reporting are believed to include underestimates for ages 22 through middle age and overestimates for individuals nearing their 21st and 65th birthdays and for those over age 65. Preferences for ages ending in certain digits (e.g., age ending in 0 and 5) may also result in undue concentrations of reported ages.⁶

18. **Place of Death** is the hospital, other institution (ER/ outpatient, nursing home/long term care facility), or Non-Institution (death occurred in decedent’s home or hospice facility) place of death.

19. An **Occurrence Death** is a death that occurs in North Carolina regardless of the decedent’s place of residence.

Formulas

1. Population

Percentage of North Carolina population residing in area	=	$\frac{\text{Population of area}}{\text{Population of North Carolina}}$	X 100
Percentage male population in area	=	$\frac{\text{Male population of area}}{\text{Total population of area}}$	X 100
Percentage female population in area	=	$\frac{\text{Female population of area}}{\text{Total population of area}}$	X 100

2. Natural Increase

Rate of natural increase	=	$\frac{\text{Number of live births minus numbers of deaths}}{\text{Population of area}}$	X 1,000
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3. Live Births

Birth rate	=	$\frac{\text{Number of live births}}{\text{Population of area}}$	X 1,000
Male birth rate	=	$\frac{\text{Number of male live births}}{\text{Population of area}}$	X 1,000
Female birth rate	=	$\frac{\text{Number of female live births}}{\text{Population of area}}$	X 1,000

4. Attendant

Percentage of live births attended by physician (MD or DO)	=	$\frac{\text{Number of live births attended by physician}}{\text{Number of live births}}$	X 100
Percentage of live births attended by Certified Nurse-Midwife	=	$\frac{\text{Number of live births attended by Certified Nurse-Midwife}}{\text{Number of live births}}$	X 100
Percentage of live births attended by other	=	$\frac{\text{Number of live births attended by other}}{\text{Number of live births}}$	X 100

5. Place of Delivery

$$\text{Percentage of live births delivered in hospital} = \frac{\text{Number of live births delivered in hospital}}{\text{Number of live births}} \times 100$$

$$\text{Percentage of live births that are home births} = \frac{\text{Number of home births}}{\text{Number of live births}} \times 100$$

$$\text{Percentage of live births delivered in other places} = \frac{\text{Number of live births delivered in other places}}{\text{Number of live births}} \times 100$$

6. Low Birthweight

$$\text{Percentage of live births classified as low weight} = \frac{\text{Number of low weight live births}}{\text{Number of live births}} \times 100$$

7. Births to Unmarried Mothers

$$\text{Percentage of live births to unmarried mothers} = \frac{\text{Number of live births to unmarried mothers}}{\text{Number of live births}} \times 100$$

8. Mother Smoked

$$\text{Percentage of live births to mothers who used tobacco during pregnancy} = \frac{\text{Number of live births to mothers who used tobacco}}{\text{Number of live births}} \times 100$$

9. C-Section

$$\text{Percentage of live births by C-section} = \frac{\text{Number of live births by C-section}}{\text{Number of live births}} \times 100$$

10. Occurrence Births

$$\text{Percentage of North Carolina live births occurring in area} = \frac{\text{Number of live births occurring in area}}{\text{Number of live births occurring in North Carolina}} \times 100$$

$$\text{Percentage of area live births occurring to residents of area} = \frac{\text{Number of resident live births occurring in area}}{\text{Number of live births occurring in area}} \times 1,000$$

11. Perinatal Deaths

$$\text{Perinatal mortality rate} = \frac{\text{Number of fetal deaths plus number of neonatal deaths}}{\text{Number of live births plus number of fetal deaths}} \times 1,000$$

12. Fetal Deaths

$$\text{Fetal mortality rate} = \frac{\text{Number of fetal deaths}}{\text{Number of live births plus number of fetal deaths}} \times 1,000$$

13. Neonatal Deaths

$$\text{Neonatal mortality rate} = \frac{\text{Number of neonatal deaths}}{\text{Number of live births}} \times 1,000$$

14. Postneonatal Deaths

$$\text{Postneonatal mortality rate} = \frac{\text{Number of postneonatal deaths}}{\text{Number of live births minus number of neonatal deaths}} \times 1,000$$

15. Infant Deaths

$$\text{Infant mortality rate} = \frac{\text{Number of infant deaths}}{\text{Number of live births}} \times 1,000$$

16. Deaths

$$\text{Death rate} = \frac{\text{Number of deaths}}{\text{Population of area}} \times 1,000$$

$$\text{Male-specific death rate} = \frac{\text{Number of male deaths}}{\text{Male population of area}} \times 1,000$$

$$\text{Female-specific death rate} = \frac{\text{Number of female deaths}}{\text{Female population of area}} \times 1,000$$

17. Age-specific Deaths

$$\text{Age-specific death rate} = \frac{\text{Number of deaths in age group}}{\text{Population in age group}} \times 1,000$$

18. Place of Death

$$\text{Percentage of deaths occurring in hospitals} = \frac{\text{Number of deaths in hospitals}}{\text{Number of deaths}} \times 100$$

$$\text{Percentage of deaths occurring in non-hospital institutions} = \frac{\text{Number of deaths in non-hospital institutions}}{\text{Number of deaths}} \times 100$$

$$\text{Percentage of deaths occurring in home or non-institution} = \frac{\text{Number of deaths in home or non-institutions}}{\text{Number of deaths}} \times 100$$

19. Occurrence Deaths

$$\begin{aligned} \text{Percentage of North Carolina deaths occurring in area} &= \frac{\text{Number of deaths occurring in area}}{\text{Number of deaths occurring in North Carolina}} \times 100 \\ \text{Percentage of area deaths occurring to residents of area} &= \frac{\text{Number of resident deaths occurring in area}}{\text{Number of deaths occurring in area}} \times 100 \end{aligned}$$

Symbols	
Quantity (frequency) is zero	0
Rate is less than 0.05	0.0
Rate is not applicable or both numerator and denominator are zero	n/a