LEADING CAUSES OF DEATH

DEATH CERTIFICATES

leading causes of death

mortality data

DEATHS
POPULATION

X 100,000

module 2

TEEN PREGNANCY

pregnancy rate

birth rate

SMOKING AND HEALTH

population-based surveys

prevalence rate

deaths due to smoking

Table of Contents

INTRODUCTION

What is covered in Module 2?

In Module 1, you explored data on *deaths* (or mortality data). The second module of this course builds on what you have already learned and introduces you to another major type of quantitative data: data on events among *living* individuals. You will focus on one type of data (teen pregnancy), explore how these data are generated, and how they can be used (or misused) to answer important questions.

What will you learn?

At the end of Module 2, you will be able to:
7   Describe the respective roles of health departments and the media in providing information to the public on h issues.
7   State the definitions of teen pregnancy and live birth, and describe the difference.
7   Describe the difference between occurrence and residence data.
7   Identify sources of data on teen pregnancy, and discuss the strengths and limitations of those data.
7   Calculate age-specific pregnancy and live birth rates.
7   Determine percentage changes in rates over time.
7   Use confidence limits and statistical significance to interpret variability.

***Before you read any further,
view Act 1 of the videotape.***

Section I. SHARING DATA

Exercise 1: Past Experience in Sharing Data

Instructions: Like Alicia, you may have been asked to provide data on health issues to reporters or other individuals. This exercise will give you the opportunity to share your experiences and explore the relationship between the health department and the media.

Below you will find the full text of the newspaper article written by Michael. Read it carefully, then take a few moments to answer the questions that follow.

Teen Pregnancies Double

By Michael Goolsby, Staff Writer

High school memories for most of us revolve around football games, proms, and float-building. Not so for far too many of our county's teenage girls. For them, reality includes midnight feedings and doctor visits for their newborns.

The number of teens who experience at least one pregnancy during their high school years has nearly doubled in Burrows County over the past two years. In 1996, the rate was 51.1 per 1,000 females ages 15-17. In just one year, that rate has skyrocketed to nearly 86 pregnancies per 1,000 teens.

At the same time that pregnancy rates doubled, however, birth rates declined slightly--from 26.3 per 1,000 females ages 15-17 in 1996 to 22.5 per 1,000 in 1997. This downward trend is mirrored in virtually every state in the nation, according to a report released recently by the National Center for Health Statistics.

While the decline in the teen birth rate can be seen as good news, the near doubling of the pregnancy rate is not. A high percentage of these teens attend Roosevelt High School, the county's largest high school and one located in an area designated as "high risk" by the State Department of Health and Family Services. Diane Morgan, RN, NP, is the full-time public health nurse assigned to provide onsite counseling, medical care, and referrals before, during, and after school.

Ms. Morgan also teaches a series of sex education classes that are required for all students. As the creator of the series, she considers the classes important but acknowledges a growing frustration. "Far too often, I sit face-to-face with a bright student, one with a once promising future, to discuss the implications of motherhood. It's truly a shame when future careers and happiness are jeopardized."

Better news could be on the way. Sex among adolescents appears to be declining at a national level. According to the National Center for Health Statistics, 50 percent of girls 15 to 19 in 1995 reported having sex at least once, down from 55 percent in 1990. That was the first decline since the surveys began in 1970.

A similar study of boys, conducted by the Urban Institute, showed a decline to 55 percent in 1995, from 60 percent in 1988.

Yet, it is not known when--or if--this downward trend in sexual activity will reach our county. While the birth rate in 1997 is a small improvement over 1996, the fact that 22 percent of our teens are having babies is not a good sign. According to Ms. Morgan, "We need to be concerned about why so many of our teens are getting pregnant, and to help those who do make the right choices."

1.   Are you or others in your health department typically asked to share statistics like those in the article with the media? If so, what do you provide and how?

2.   Have data provided by you or others in your health department ever been misinterpreted or misused? If so, what happened and why? How did you react?

3.   What is the health department's role in informing the public about health issues?

4.   What is the media's role in informing the public about health issues?

> ***Before you read any further,***
> ***be sure to view Act 2 of the videotape.***

Section II. TEEN PREGNANCY RATES

What is a "teen?"

Technically, teens include all individuals who are at least 10 years of age, but have not yet had their 20th birthday. The age group most commonly used in historical and national data is 15-19 years old. Other common age groupings for the teen years are:

> 10-14 years old
> 15-17 years old
> 18-19 years old

As you learned in Module 1, the total number of people in a particular age group (in this case, teens) is usually based on the Census, which is conducted in the U.S. every 10 years. Population estimates for your State or county for years in between census years are available from your state health department.

What is the difference between a birth and a pregnancy?

Many people erroneously use the terms "birth" and "pregnancy" interchangeably. If each pregnancy went full-term and resulted in one (and only one) healthy newborn, then these two terms would have exactly the same meaning. However, this is not always the case. Some pregnancies are terminated through spontaneous abortion or induced abortion; still others result in fetal deaths. A small proportion result in multiple births (twins, triplets, etc.), which means that one pregnant woman will have two or more live births, fetal deaths, or some combination of live births and fetal deaths.

> @   It takes substantial resources to link twins and triplets among live
>   births and fetal deaths. The numbers of births and fetal deaths are
>   therefore treated as if they were individual pregnancies. In any
>   event, the number of twin and higher-order pregnancies among
>   teens is very low.

Thus, the number of pregnancies is always larger than the number of births. Three separate numbers (or counts) are used to estimate total pregnancies:

> 7   Live births (live born infants at any gestational age)
> 7   Fetal deaths (when available; in the majority of states only fetal deaths of 80 weeks
>   gestation or more are reported)
> 7   Abortions (at any gestational age).

The sum of these numbers is equal to our best estimate of the number of pregnancies. The formula for the number (or count) of pregnancies is:

$$\textit{Number of pregnancies } = \textit{ live births} + \textit{fetal deaths} + \textit{abortions}$$

The formula for the number of **teen** pregnancies is:

$$\textit{Number of teen pregnancies } = \textit{live births } + \textit{ fetal deaths } + \textit{ abortions (all among teens)}$$

What is the difference between occurrence and residence data?

Births, fetal deaths, and abortions are registered by the location (city, county, and state) in which they occurred (place of *occurrence*). As long as the place of *residence* of the woman is recorded, however, these events (births, fetal deaths, and abortions) can be classified by place of *residence*. Classifying by place of *residence* is more appropriate for our public health purposes since the focus for planning and intervention is often on a population group defined by its common place of residence. In addition, rates that measure the risk of an event are computed using census data, which are also recorded by *residence*.

What are the sources of data for measuring teen pregnancy?

Births, fetal deaths, and abortions are all derived from different data sources. These sources, along with their strengths and limitations, are discussed below.

Births
Birth certificates are completed for every birth in the United States. State laws require that a birth certificate be completed for every birth occurring within the state. In all states, the hospital or the attendant at birth are legally responsible for filing (or registering) a completed birth certificate. Parents are responsible for registering births that occur at home without a medical attendant. Nearly every birth occurring in this country is registered.

Birth certificates for all births occurring in a state are submitted to and maintained by the state's vital statistics registrar. If a female resident of one state gives birth in another state, the birth certificate is filed in the state in which the birth occurred (place of occurrence); however a copy is provided to the vital statistics registrar of the State in which the mother resides. The National Center for Health Statistics compiles the data from each state for each calendar year into a national data file for all births occurring in the United States. (The vital statistics registrar also keeps track of death certificates, as discussed in Module 1.) Data reported by the National Center for Health Statistics are generally tabulated by place of residence.

Figure 1 shows the U.S. Standard Certificate of Live Birth. Key information that can be derived from the certificate are:

7   Age, race, and marital status of mother
7   Period of gestation
7   Birth weight and sex of infant
7   Birth order of infant
7   Medical and lifestyle risk factors for the pregnancy
7   Obstetric procedures
7   Method of delivery
7   Complications of labor and/or delivery
7   Congenital anomalies and abnormal conditions of the infant.

All of the medical information is contained on the confidential portion of the certificate and is used for statistical purposes only.

Fetal Deaths

The definition of fetal deaths, adopted worldwide, is:

> *Death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.*[1]

Adoption of this definition ended confusion over use of such terms as stillbirth, spontaneous abortion, and miscarriage. Furthermore, fetal deaths are classified for statistical purposes as:

Early	Less than 20 completed weeks of gestation	Group I
Intermediate	20 completed weeks of gestation but less than 28	Group II
Late	28 completed weeks of gestation and over	Group III
Other	Gestation period not classifiable in groups I, II, and III	Group IV

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[1] US Department of Health and Human Services. Vital statistics of the United States, 1990. Vol II-mortality. Hyattsville, MD: National Center for Health Statistics, Public Health Service, US Department of Health and Human Services, 1990.

Figure 2 shows the U.S. Standard Report of Fetal Death. Reporting requirements for fetal deaths vary from state to state. All states require reporting of fetal deaths at gestations of 20 weeks or more; some states require the reporting of all fetal deaths regardless of gestational age. Incomplete reporting is most likely to occur in the earlier part of the required reporting period since, at the earliest stages of gestation, the woman may not yet know that she is pregnant.

The fetal death report contains the same information as the birth certificate, but also includes information on the cause of fetal death. The cause of death section is similar to the corresponding section of the U.S. Standard Certificate of Death, and asks for immediate, intermediate, and underlying causes of death and other significant conditions (as defined and discussed in Module 1). The National Center for Health Statistics compiles the fetal death data from each state for each calendar year to derive a national profile.

Abortions

Abortion providers in most states are required to file with their State health department an induced termination of pregnancy report for each abortion they perform. This report includes questions on the patients' age, race, ethnicity, place of residence, weeks of gestation, and method of termination. No incentive exists, however, to report abortions and abortion characteristics completely, and there is no national registration system. Public health priorities in state health departments may relegate enforcement of abortion reporting to a low priority. In addition, concerns about confidentiality and security often inhibit providers from reporting.

The Centers for Disease Control and Prevention (CDC) in Atlanta maintains a voluntary surveillance system of abortion statistics based on tabular data provided by State health departments. Because these data are viewed as low priority in many States, they vary in completeness and accuracy. National estimates of the number of abortions are available from CDC but the characteristics of the abortion (e.g., patient's age, race, ethnicity) are not available for all States.

The place of residence of the patient is also not well reported; consequently, CDC reports abortions by *place of occurrence*. Abortions pose a special problem for residence/occurrence data. Abortion clinics in one county may provide services to women who reside in other counties where abortion services are not readily available. Counts of abortions in such areas will be exaggerated and inaccurate, and teenage pregnancy statistics for such areas will be similarly compromised.

Figure 1.

TYPE/PRINT IN PERMANENT BLACK INK FOR INSTRUCTIONS SEE HANDBOOK

CHILD

LOCAL FILE NUMBER

U.S. STANDARD
CERTIFICATE OF LIVE BIRTH

BIRTH NUMBER

1. CHILD'S NAME *(First,Middle,Last)*

2. DATE OF BIRTH *(Month,Day,Year)*

3. TIME OF BIRTH
M

4. SEX   5. CITY, TOWN, OR LOCATION OF BIRTH

6. COUNTY OF BIRTH

7. PLACE OF BIRTH: ☐ Hospital   ☐ Freestanding Birthing Center
☐ Clinic/Doctor's Office   ☐ Residence
☐ Other *(Specify)*

8. FACILITY NAME *(If not institution, give street and number)*

CERTIFIER/ATTENDANT

DEATH UNDER ONE YEAR OF AGE Enter State File Number of death certificate for this child

9. I certify that this child was born alive at the place and time and on the date stated.

Signature ▶

10. DATE SIGNED *(Month,Day,Year)*

11. ATTENDANT'S NAME AND TITLE *(If other than certifier)* *(Type/Print)*
Name
☐ M.D.   ☐ D.O.   ☐ C.N.M.   ☐ Other Midwife
☐ Other *(Specify)*

12. CERTIFIER'S NAME AND TITLE *(Type/Print)*
Name
☐ M.D.   ☐ D.O.   ☐ Hospital Admin.   ☐ C.N.M.   ☐ Other Midwife
☐ Other *(Specify)*

13. ATTENDANT'S MAILING ADDRESS *(Street and Number or Rural Route Number, City or Town, State, Zip Code)*

14. REGISTRAR'S SIGNATURE
▶

15. DATE FILED BY REGISTRAR *(Month,Day,Year)*

MOTHER

16a. MOTHER'S NAME *(First,Middle,Last)*

16b. MAIDEN SURNAME

17. DATE OF BIRTH *(Month,Day,Year)*

18. BIRTHPLACE *(State or Foreign Country)*

19a. RESIDENCE—STATE

19b. COUNTY

19c. CITY, TOWN, OR LOCATION

19d. STREET AND NUMBER

19e. INSIDE CITY LIMITS? *(Yes or no)*

20. MOTHER'S MAILING ADDRESS *(If same as residence, enter Zip Code only)*

FATHER

21. FATHER'S NAME *(First,Middle,Last)*

22. DATE OF BIRTH *(Month,Day,Year)*

23. BIRTHPLACE *(State or Foreign Country)*

INFORMANT

24. I certify that the personal information provided on this certificate is correct to the best of my knowledge and belief.
Signature of Parent or Other Informant ▶

INFORMATION FOR MEDICAL AND HEALTH USE ONLY

		27. EDUCATION *(Specify only highest grade completed)*	
25. OF HISPANIC ORIGIN? (Specify No or Yes—If yes, specify Cuban, Mexican, Puerto Rican, etc.)	26. RACE—American Indian, Black, White, etc. *(Specify below)*	Elementary/Secondary (0-12)	College (1-4 or 5+)

MOTHER

25a. ☐ No ☐ Yes
Specify:

26a.

27a.

FATHER

25b. No ☐ Yes
Specify:

26b.

27b.

28. PREGNANCY HISTORY *(Complete each section)*		29. MOTHER MARRIED? (At birth, conception, or any time between) *(Yes or no)*	30. DATE LAST NORMAL MENSES BEGAN *(Month,Day,Year)*
LIVE BIRTHS *(Do not include this child)*	OTHER TERMINATIONS *(Spontaneous and induced at any time after conception)*		

MULTIPLE BIRTHS Enter State File Number for Mate(s) LIVE BIRTH(S)

FETAL DEATH(S)

28a. Now Living	28b. Now Dead	28d.	31. MONTH OF PREGNANCY PRENATAL CARE BEGAN—First, Second, Third, etc. *(Specify)*	32. PRENATAL VISITS—Total Number *(If none, so state)*
Number	Number	Number		
☐ None	☐ None	☐ None	33. BIRTH WEIGHT *(Specify unit)*	34. CLINICAL ESTIMATE OF GESTATION *(Weeks)*
28c. DATE OF LAST LIVE BIRTH *(Month,Year)*		28e. DATE OF LAST OTHER TERMINATION *(Month,Year)*	35a. PLURALITY—Single, Twin, Triplet, etc. *(Specify)*	35b. IF NOT SINGLE BIRTH—Born First, Second, Third, etc. *(Specify)*

36. APGAR SCORE		37a. MOTHER TRANSFERRED PRIOR TO DELIVERY? ☐ No ☐ Yes If Yes, enter name of facility transferred from:
36a. 1 Minute	36b. 5 Minutes	
		37b. INFANT TRANSFERRED? ☐ No ☐ Yes If Yes, enter name of facility transferred to:

Figure 1. Continued

38a. MEDICAL RISK FACTORS FOR THIS PREGNANCY
(Check all that apply)

Anemia (Hct. <30/Hgb. <10) .... 01 ☐
Cardiac disease .... 02 ☐
Acute or chronic lung disease .... 03 ☐
Diabetes .... 04 ☐
Genital herpes .... 05 ☐
Hydramnios/Oligohydramnios .... 06 ☐
Hemoglobinopathy .... 07 ☐
Hypertension, chronic .... 08 ☐
Hypertension, pregnancy-associated .... 09 ☐
Eclampsia .... 10 ☐
Incompetent cervix .... 11 ☐
Previous infant 4000+ grams .... 12 ☐
Previous preterm or small-for-gestational-age
 infant .... 13 ☐
Renal disease .... 14 ☐
Rh sensitization .... 15 ☐
Uterine bleeding .... 16 ☐
None .... 00 ☐
Other _____ 17 ☐
 (Specify)

38b. OTHER RISK FACTORS FOR THIS PREGNANCY
(Complete all items)

Tobacco use during pregnancy .... Yes ☐ No ☐
 Average number cigarettes per day _____
Alcohol use during pregnancy .... Yes ☐ No ☐
 Average number drinks per week _____
Weight gained during pregnancy _____ lbs.

39. OBSTETRIC PROCEDURES
(Check all that apply)

Amniocentesis .... 01 ☐
Electronic fetal monitoring .... 02 ☐
Induction of labor .... 03 ☐
Stimulation of labor .... 04 ☐
Tocolysis .... 05 ☐
Ultrasound .... 06 ☐
None .... 00 ☐
Other _____ 07 ☐
 (Specify)

40. COMPLICATIONS OF LABOR AND/OR DELIVERY
(Check all that apply)

Febrile (>100°F. or 38°C.) .... 01 ☐
Meconium, moderate/heavy .... 02 ☐
Premature rupture of membrane (>12 hours) .... 03 ☐
Abruptio placenta .... 04 ☐
Placenta previa .... 05 ☐
Other excessive bleeding .... 06 ☐
Seizures during labor .... 07 ☐
Precipitous labor (<3 hours) .... 08 ☐
Prolonged labor (>20 hours) .... 09 ☐
Dysfunctional labor .... 10 ☐
Breech/Malpresentation .... 11 ☐
Cephalopelvic disproportion .... 12 ☐
Cord prolapse .... 13 ☐
Anesthetic complications .... 14 ☐
Fetal distress .... 15 ☐
None .... 00 ☐
Other _____ 16 ☐
 (Specify)

41. METHOD OF DELIVERY *(Check all that apply)*

Vaginal .... 01 ☐
Vaginal birth after previous C-section .... 02 ☐
Primary C-section .... 03 ☐
Repeat C-section .... 04 ☐
Forceps .... 05 ☐
Vacuum .... 06 ☐

42. ABNORMAL CONDITIONS OF THE NEWBORN
(Check all that apply)

Anemia (Hct. <39/Hgb. < 13) .... 01 ☐
Birth injury .... 02 ☐
Fetal alcohol syndrome .... 03 ☐
Hyaline membrane disease/RDS .... 04 ☐
Meconium aspiration syndrome .... 05 ☐
Assisted ventilation <30 min .... 06 ☐
Assisted ventilation ≥30 min .... 07 ☐
Seizures .... 08 ☐
None .... 00 ☐
Other _____ 09 ☐
 (Specify)

43. CONGENITAL ANOMALIES OF CHILD
(Check all that apply)

Anencephalus .... 01 ☐
Spina bifida/Meningocele .... 02 ☐
Hydrocephalus .... 03 ☐
Microcephalus .... 04 ☐
Other central nervous system anomalies
 (Specify) _____ 05 ☐

Heart malformations .... 06 ☐
Other circulatory/respiratory anomalies
 (Specify) _____ 07 ☐

Rectal atresia/stenosis .... 08 ☐
Tracheo-esophageal fistula/ Esophageal atresia ... 09 ☐
Omphalocele/ Gastroschisis .... 10 ☐
Other gastrointestinal anomalies
 (Specify) _____ 11 ☐

Malformed genitalia .... 12 ☐
Renal agenesis .... 13 ☐
Other urogenital anomalies
 (Specify) _____ 14 ☐

Cleft lip/palate .... 15 ☐
Polydactyly/Syndactyly/Adactyly .... 16 ☐
Club foot .... 17 ☐
Diaphragmatic hernia .... 18 ☐
Other musculoskeletal/integumental anomalies
 (Specify) _____ 19 ☐

Down's syndrome .... 20 ☐
Other chromosomal anomalies
 (Specify) _____ 21 ☐

None .... 00 ☐
Other _____ 22 ☐
 (Specify)

Figure 2.

TYPE/PRINT
IN
PERMANENT
BLACK INK
FOR
INSTRUCTIONS
SEE
HANDBOOK

U.S. STANDARD
REPORT OF FETAL DEATH   STATE FILE NUMBER

1. FACILITY NAME *(If not institution, give street and number)*	

2. CITY, TOWN, OR LOCATION OF DELIVERY	3. COUNTY OF DELIVERY	4. DATE OF DELIVERY *(Month,Day,Year)*	5. SEX OF FETUS

PARENTS

6a. MOTHER'S NAME *(First,Middle,Last)*	6b. MAIDEN SURNAME	7. DATE OF BIRTH *(Month,Day,Year)*

8a. RESIDENCE-STATE	8b. COUNTY	8c. CITY, TOWN, OR LOCATION	8d. STREET AND NUMBER	

8e. INSIDE CITY LIMITS? *(Yes or no)*	8f. ZIP CODE	9. FATHER'S NAME *(First,Middle,Last)*	10. DATE OF BIRTH *(Month,Day,Year)*

MOTHER

FATHER

11. OF HISPANIC ORIGIN? (Specify No or Yes—If yes, specify Cuban, Mexican, Puerto Rican, etc.)	12. RACE—American Indian, Black, White, etc. *(Specify below)*	13. EDUCATION *(Specify only highest grade completed)*		14. OCCUPATION AND BUSINESS/INDUSTRY *(Worked during last year)*	
		Elementary/Secondary (0-12)	College (1-4 or 5+)	Occupation	Business/Industry
11a. ☐ No ☐ Yes Specify:	12a.	13a.		14a.	14b.
11b. ☐ No ☐ Yes Specify:	12b.	13b.		14c.	14d.

MULTIPLE BIRTHS
Enter State File
Number for
Mate(s)
LIVE BIRTH(S)

FETAL DEATH(S)

15. PREGNANCY HISTORY *(Complete each section)*			16. MOTHER MARRIED? (At delivery, conception, or any time between) *(Yes or no)*	17. DATE LAST NORMAL MENSES BEGAN *(Month,Day,Year)*
LIVE BIRTHS		OTHER TERMINATIONS *(Spontaneous and induced at any time after conception)*		
15a. Now Living Number ____ ☐ None	15b. Now Dead Number ____ ☐ None	15d. *(Do not include this fetus)* Number ____ ☐ None	18. MONTH OF PREGNANCY PRENATAL CARE BEGAN—First, Second, Third, etc. *(Specify)*	19. PRENATAL VISITS—Total Number *(If none, so state)*
			20. WEIGHT OF FETUS *(Specify Unit)*	21. CLINICAL ESTIMATE OF GESTATION *(Weeks)*
15c. DATE OF LAST LIVE BIRTH *(Month,Year)*		15e. DATE OF LAST OTHER TERMINATION *(Month,Year)*	22a. PLURALITY—Single, Twin, Triplet, etc. *(Specify)*	22b. IF NOT SINGLE BIRTH—Born First, Second, Third, etc. *(Specify)*

Continued on next page

Figure 2. Continued

MEDICAL AND HEALTH INFORMATION

23a. MEDICAL RISK FACTORS FOR THIS PREGNANCY
(Check all that apply)

Anemia (Hct. < 30/Hgb. < 10) .... 01 ☐
Cardiac disease .... 02 ☐
Acute or chronic lung disease .... 03 ☐
Diabetes .... 04 ☐
Genital herpes .... 05 ☐
Hydramnios/Oligohydramnios .... 06 ☐
Hemoglobinopathy .... 07 ☐
Hypertension, chronic .... 08 ☐
Hypertension, pregnancy-associated .... 09 ☐
Eclampsia .... 10 ☐
Incompetent cervix .... 11 ☐
Previous infant 4000+ grams .... 12 ☐
Previous preterm or small-for-gestational-age
   infant .... 13 ☐
Renal disease .... 14 ☐
Rh sensitization .... 15 ☐
Uterine bleeding .... 16 ☐
None .... 00 ☐
Other _____ 17 ☐
   (Specify)

23b. OTHER RISK FACTORS FOR THIS PREGNANCY
(Complete all items)

Tobacco use during pregnancy .... Yes ☐ No ☐
   Average number cigarettes per day _____
Alcohol use during pregnancy .... Yes ☐ No ☐
   Average number drinks per week _____
Weight gained during pregnancy _____ lbs.

24. OBSTETRIC PROCEDURES
(Check all that apply)

Amniocentesis .... 01 ☐
Electronic fetal monitoring .... 02 ☐
Induction of labor .... 03 ☐
Stimulation of labor .... 04 ☐
Tocolysis .... 05 ☐
Ultrasound .... 06 ☐
None .... 00 ☐
Other _____ 07 ☐
   (Specify)

25. COMPLICATIONS OF LABOR AND/OR DELIVERY
(Check all that apply)

Febrile (>100°F. or 38°C.) .... 01 ☐
Meconium, moderate/heavy .... 02 ☐
Premature rupture of membrane (>12 hours) ..... 03 ☐
Abruptio placenta .... 04 ☐
Placenta previa .... 05 ☐
Other excessive bleeding .... 06 ☐
Seizures during labor .... 07 ☐
Precipitous labor (< 3 hours) .... 08 ☐
Prolonged labor (>20 hours) .... 09 ☐
Dysfunctional labor .... 10 ☐
Breech/Malpresentation .... 11 ☐
Cephalopelvic disproportion .... 12 ☐
Cord prolapse .... 13 ☐
Anesthetic complications .... 14 ☐
Fetal distress .... 15 ☐
None .... 00 ☐
Other _____ 16 ☐
   (Specify)

26. METHOD OF DELIVERY *(Check all that apply)*

Vaginal .... 01 ☐
Vaginal birth after previous C-section .... 02 ☐
Primary C-section .... 03 ☐
Repeat C-section .... 04 ☐
Forceps .... 05 ☐
Vacuum .... 06 ☐
Hysterotomy/Hysterectomy .... 07 ☐

27. CONGENITAL ANOMALIES OF FETUS
(Check all that apply)

Anencephalus .... 01 ☐
Spina bifida/Meningocele .... 02 ☐
Hydrocephalus .... 03 ☐
Microcephalus .... 04 ☐
Other central nervous system anomalies
   (Specify) _____ 05 ☐

Heart malformations .... 06 ☐
Other circulatory/respiratory anomalies
   (Specify) _____ 07 ☐

Rectal atresia/stenosis .... 08 ☐
Tracheo esophageal fistula/Esophageal atresia ..... 09 ☐
Omphalocele/Gastroschisis .... 10 ☐
Other gastrointestinal anomalies
   (Specify) _____ 11 ☐

Malformed genitalia .... 12 ☐
Renal agenesis .... 13 ☐
Other urogenital anomalies
   (Specify) _____ 14 ☐

Cleft lip/palate .... 15 ☐
Polydactyly/Syndactyly/Adactyly .... 16 ☐
Club foot .... 17 ☐
Diaphragmatic hernia .... 18 ☐
Other musculoskeletal/integumental anomalies
   (Specify) _____ 19 ☐

Down's syndrome .... 20 ☐
Other chromosomal anomalies
   (Specify) _____ 21 ☐

None .... 00 ☐
Other _____ 22 ☐
   (Specify)

CAUSE OF FETAL DEATH

28.

Enter only one cause per line for a, b, and c.

PART I. Fetal or maternal condition directly causing fetal death.

IMMEDIATE CAUSE

a. _____ | Specify Fetal or Maternal

DUE TO (OR AS A CONSEQUENCE OF):

Fetal and/or maternal conditions, if any, giving rise to the immediate cause(s), stating the underlying cause last.

b. _____ | Specify Fetal or Maternal

DUE TO (OR AS A CONSEQUENCE OF):

c. _____ | Specify Fetal or Maternal

PART II. Other significant conditions of fetus or mother contributing to fetal death but not resulting in the underlying cause given in Part I.

29. FETUS DIED BEFORE LABOR, DURING LABOR OR DELIVERY, UNKNOWN *(Specify)*

30. ATTENDANT'S NAME AND TITLE *(Type/Print)*

Name _____

☐ M.D. ☐ D.O. ☐ C.N.M. ☐ Other Midwife

☐ Other *(Specify)* _____

31. NAME AND TITLE OF PERSON COMPLETING REPORT *(Type/Print)*

Name _____

Title _____

What is the teen birth rate?

In Module 1, you learned that a **rate** is the most common way to measure the frequency of an event in a population. A rate tells us the "risk" that a given event will occur. As a reminder, the general formula for a rate is as follows:

Rate   =   Number of events occurring during a given time period   x   1,000
            Population at risk during the same time period

The teen birth rate is a measure of the frequency of births among female teens. It is an age-specific rate and has the following formula:

Teen birth rate   =   Number of live births among female teens during a given time period   x   1,000
                        Size of female teen population during the same time period

Example: Teen Birth Rate

The birth rate among 15-17 year olds in New York in 1996 would be:

Number of live births among 15-17 year old females residing in New York in 1996   x 1,000
          Number of 15-17 year old females residing in New York, 1996

As discussed in Module 1, we multiply by 1,000 to get a number that is easier to discuss, manipulate, and compare.

What is the teen pregnancy rate?

Similarly, the pregnancy rate is a measure of the frequency of pregnancy in the population. For the general population of women, the formula is:

Pregnancy rate =   Number of live births, fetal deaths, and
                  abortions for women age 15-44 during a given time period   x   1,000
                  Number of women age 15-44 during the same time period

The age group 15-44 is used because it represents what is commonly referred to as "women of childbearing age."

Among teens, the age-specific formula is as follows:

Teen pregnancy rate =   Number of live births, fetal deaths, and
                    abortions among female teens during a given time period   x   1,000
                    Size of female teen population during the same time period

Example: Teen Pregnancy Rate

The teen pregnancy rate among 15-17 year olds in New York in 1996 would be:

Number of live births, fetal deaths, and abortions
among 15-17 year old females residing in New York in 1996   x   1,000
Number of 15-17 year old females residing in New York, 1996

What are some common mistakes in calculating these rates?

When calculating teen birth and pregnancy rates, a few simple cautions are in order.

Š   Define the specific age group or groups that are of interest, and use them consistently in both the numerator and denominator.

Š   Never add rates for two separate age groups to derive the overall rate for the entire age group. Although it is tempting, you cannot add the rate for females age 15-17 to the rate for females age 18-19 to determine the overall rate for 15-19 year olds. To do so would assume that the population in each group (the denominators) were identical, which is rarely the case. Instead, you must calculate the overall age group rate separately using the specific number of births or pregnancies in that age group and the total population.

Š   Also be sure to use the same time period (one or more years) in the numerator and denominator.

Š   Always use residence data if they are available.

Š   Calculate the rate using the same geographical area (residence) in the numerator and denominator.

Š   Be cautious when trying to link teen pregnancy prevention initiatives to teen pregnancy or birth rates. In the absence of a well-designed, scientific research project to identify specific causes for increases or decreases in rates, the best that you can do is to suggest some of the factors that you believe are involved, for example, new programs promoting abstinence or greater availability of family planning services to teens who are sexually active.

Exercise 2: Calculating Teen Birth and Pregnancy Rates

Instructions: In this exercise, you will join Alicia in calculating the birth rate and teen pregnancy rate for females in Burrows County in 1997. To help you, we have provided a copy of the fax that Alicia sent to Michael (Table 1), along with some additional figures that Michael collected on his own. Show your answers rounded to one decimal place.

Table 1
Teen Pregnancy Data on Females, Age 15-17, Burrows County, 1997

	Data
Live births	210
Fetal deaths	6
Resident abortions	223
Population	9,314

Additional Information Collected by Michael:
    Number of abortions performed among 15-17 year olds in Burrows County: 582

1.   What is the birth rate for females in Burrows County, age 15-17, in 1997?

2.   What is the pregnancy rate for females in Burrows County, age 15-17, in 1997?

3.   Suppose that Michael, by mistake, calculated the pregnancy rate for females age 15-17 using abortions by place of occurrence. What would the pregnancy rate be then?

4.   Are your rates the same as the rates quoted by Michael in the article? If not, how do they differ? How can you explain any differences?

Before you read any further,
view Act 3 of the videotape.

Section III. COMPARING RATES

What comparisons can be made with pregnancy rates?

In Module 1, you were introduced to the value of rates in making comparisons. Since teen pregnancy rates are specific to females, we can use them to draw comparisons between age groups and between different time periods.

Comparing age groups using a ratio
For this comparison, ratios are often used (see Module 1). In the case of pregnancy rates, the formula for calculating the ratio would be:

$$X \div Y$$

> *where:*
>> X = *pregnancy rate in age group A*
>> Y = *pregnancy rate in age group B*

Comparing age groups using the percent difference
You can also compute the percent difference between age groups. To compare the pregnancy rate in age group B with the pregnancy rate in age group A, the formula would be:

$$(Y - X) \div X \quad x \quad 100$$

To compare the pregnancy rate in age group A with the pregnancy rate in age group B, the formula would be the reverse:

$$(X - Y) \div Y \quad x \quad 100$$

Example: Comparisons by Age

Suppose the pregnancy rate for females age 15-17 is 71, and the pregnancy rate for females age 18-19 is 172. If you wanted to know how much higher the older teens' pregnancy rate was compared to the younger teens' rate, you would perform the following calculation:

$$(172 - 71) \div 71 \text{ x } 100 \quad = \quad 101 \div 71 \text{ x } 100 \quad = \quad 142.3\% \text{ higher}$$

On the other hand, if you wanted to know how much lower the younger teens' pregnancy rate was, your calculation would look like this:

$$(71 - 172) \div 172 \text{ x } 100 \quad = \quad (-101) \div 172 \text{ x } 100 \quad = \quad -58.7\% \text{ or about } 59\% \text{ lower}$$

Comparing changes over time

The best way to examine changes in rates from one year to the next is to calculate the percentage change in the rate. The formula for calculating percentage change is:

Percentage change = $\dfrac{\textit{Pregnancy rate for most recent year - Pregnancy rate for prior year}}{\textit{Pregnancy rate for prior year}} \quad x \quad 100$

Example: Comparisons over Time

If the pregnancy rates for females age 15-17, living in Colorado in 1995 and 1996, were 69 and 73, respectively, the percentage change in the rate from 1995 to 1996 would be:

$$\frac{1996 - 1995}{1995} \quad x \quad 100 \qquad \text{or} \qquad \frac{73 - 69}{69} \quad x \quad 100$$

This equals 5.8% which means that, in this example, the teen pregnancy rate increased nearly 6% in one year.

Comparing geographic areas

Comparisons can also be made between various counties in a state, between states, and between a county or state and the nation as a whole. The formulas presented above would be adjusted accordingly. Geographic comparisons generally should be made using the percent difference.

What happens when the numbers are small?

Caution should be used when calculating teen pregnancy rates for girls under 15 years of age, since the numerators will be so small as to render them meaningless. Only about 12,000 live births occur in that age group in the entire United States each year, with about the same number of abortions. Any rates computed using these small numbers would also fluctuate erratically from year to year for states and local geographic units.

Similarly, teen pregnancy rates for individual schools or clinics are also problematic. Calculations should be made for large population groups (such as cities and counties) to assure meaningful statistics and enable valid comparisons. Even then, however, unless the community is very large (such as Chicago or San Francisco), any year-to-year changes in teen pregnancy rates are not likely to be statistically significant (discussed in more detail in Section IV). In such cases, you can indicate that your results are consistent with those found by others in communities of comparable size and characteristics. Be persistent in collecting and analyzing your own data, though, for you will feel more confident of your results if a trend continues for several years.

How are rates converted into percentages?

While rates are calculated per 1,000 or 100,000 population, they can often be expressed as percentages. A percentage is expressed as "per 100 people."

To convert a rate per 1,000 to a percentage, simply move the decimal point **one** digit to the left (essentially dividing the rate by 10).

To convert a rate per 100,000 to a percentage (like those in Module 1), you would move the decimal point **three** digits to the left.

Example: Rates as Percentages

Suppose the birth rate among females age 15-19 in 1997 were 15.3 per 1,000. This could be expressed as 1.53 per 100, meaning that 1.53% of the females age 15-19 had live births that year.

Further suppose that the suicide rate in the total population was 38.8 per 100,000. This represents 0.0388 per 100 or .04% of the population dying by suicide.

What alternatives exist if accurate data on fetal deaths and abortions are not available?

If accurate data on fetal deaths do not exist, simply calculate teen pregnancy rates using birth and abortion statistics. Fetal death counts are usually low, particularly in the teen population, and will not significantly affect rates. When presenting your data, however, be sure to note that your statistics do not include fetal deaths.

If abortion data are not available or if the data for abortions are available only by place of occurrence, consider using the teenage birth rate. Make it clear that the rates are based on live births — not pregnancies. Another option is to report abortion trends for those areas that DO have reliable and consistent data (for instance, the state as a whole) since the difference between residence and occurrence usually has less impact for larger geographic areas. This may or may not be appropriate or feasible, depending on the completeness and reliability of the abortion data being used.

Exercise 3: Comparing Teen Birth and Pregnancy Rates

Instructions: In this exercise you join Alicia in calculating the percentage change in teen birth and pregnancy rates in Burrows County from 1996 to 1997. Data for 1996 are provided on Table 2; data for 1997 can be derived from Exercise 2. Show your answers rounded to one decimal place.

Table 2
Data on Females, Age 15-17, Burrows County, 1996

	Numbers
Live births	241
Fetal deaths	1
Resident abortions	226
Population	9,167

1.   What is the birth rate for females, age 15-17, in 1996?

2.   What percent of females age 15-17 had a live birth in 1996? In 1997?

3.   What is the pregnancy rate for females, age 15-17, in 1996?

4.   What is the percentage change in birth rates from 1996 to 1997 among 15-17 year olds?

5.   What is the percentage change in pregnancy rates from 1996 to 1997 among 15-17 year olds?

6.   Are your answers to questions 1, 2, and 3, above, the same as those quoted in the article? If not, how do they differ and why?

Exercise 4: Identifying Common Mistakes with Rates

Instructions: Now that you have a "true" picture of resident teen pregnancies in Burrows County, you can pinpoint the mistakes that our characters made in sharing, using, and interpreting the data.

1. The newspaper article included the following statements involving or interpreting data. Based on your calculations, indicate which statements were correct and which were erroneous.

Statement	Correct	Incorrect
a. The pregnancy rate for females age 15-17 in 1996 was 51.1 per 1,000 females.		
b. The pregnancy rate for females age 15-17 in 1997 was nearly 86 per 1,000 teens.		
c. The pregnancy rate for females age 15-17 doubled from 1996 to 1997.		
d. The birth rate for females age 15-17 in 1996 was 26.3 per 1,000 females.		
e. The birth rate for females age 15-17 in 1997 was 22.5 per 1,000 females.		
f. Twenty-two percent of teens had babies in 1997.		

2. For those statements that were not correct, reword them in the space below so that the revised statements reflect the data more accurately.

3. What mistakes did Michael make? What could have been done to avoid them?

4. What could Alicia have done to ensure that Michael understood the data?

***Now return to the videotape
to view Act 4.***

Section IV. STATISTICAL SIGNIFICANCE

What is variability?

This section introduces you to the concept of variability in rates. **In general, rates (in this case, birth rates) are more variable in smaller populations.** This is because the numerator (again, in our case, the number of live births) varies more — or varies by a greater proportion — from one year to the next in a small population than it does in a large population.

Why is variability important?

Variability affects how we interpret changes in rates over time. It also influences our ability to compare rates from different geographic areas, sexes, age groups, etc. A rate that varies greatly from year to year complicates our ability to predict what that rate might be in the coming year. It also makes it difficult to determine whether a change in the rate represents a "true" (and thus, important) difference — or whether it is just an unusually low or high point or a one-time "fluke."

Exercise 5: Measuring Confidence

Instructions: This exercise introduces the concepts of confidence limits and statistical significance. Examine the figure, the birth rates below it, and the background information on the three geographic areas. Then answer the questions.

Figure 3
    Live Birth Rates for Women Age 15-17, for Oregon and Selected Counties, 1985-96
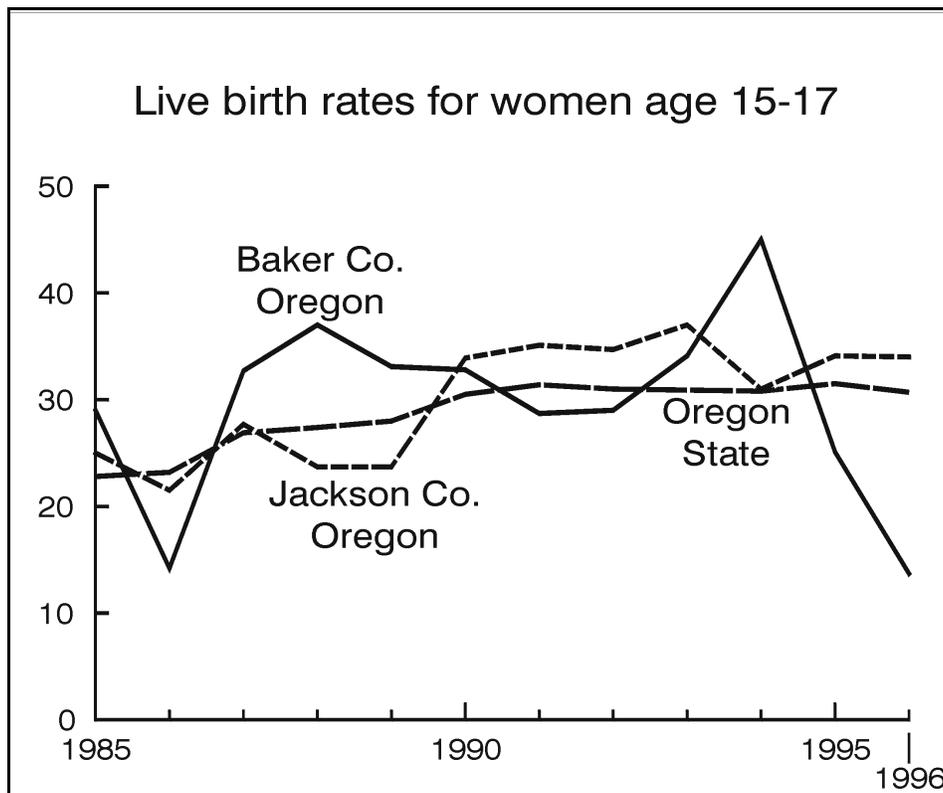
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Live birth rate per 1,000 women							
Baker Co. Oregon	29.0	14.2	32.7	37.0	33.1	32.8	28.7	29.0	34.1	45.0	25.1	13.7
Jackson Co. Oregon	25.0	21.5	27.7	23.7	23.7	33.9	35.1	34.7	37.0	31.0	34.1	34.0
State of Oregon	22.8	23.2	26.9	27.4	28.0	30.5	31.4	31.0	30.9	30.8	31.5	30.7
					Number of live births to women 15-17							
Baker Co. Oregon	10	5	11	12	10	10	9	9	11	15	9	5
Jackson Co. Oregon	78	69	84	74	71	98	104	104	116	104	116	118
State of Oregon	1349	1368	1507	1547	1519	1660	1764	1787	1843	1905	1977	2015
					Number of women 15-17 years of age							
Baker Co. Oregon	345	352	336	324	302	305	314	310	323	333	358	366
Jackson Co. Oregon	3124	3216	3033	3120	2998	2892	2966	2993	3132	3357	3404	3469
State of Oregon	59085	58889	56110	56450	54173	54446	56264	57601	59701	61809	62679	65672

Background Information

	Baker County	Jackson County	State of Oregon
Estimated population, 1990	15,000	150,000	2.9 million
No. live births to women 15-17 years of age, 1990	10	98	1,660
No. women 15-17 years of age, 1990	305	2,892	54,446
Range in no. live births to women 15-17, 1985 to 1996	5 to 15	69 to 118	1,349 to 2,015

1. Which geographic area had the highest and lowest birth rates for women 15-17 from 1985 to 1996?

2. Which geographic area had the lowest birth rate in 1989?

3. Which geographic area had the highest birth rate in 1993?

4. Did the birth rate in either of the two counties ever equal the birth rate for the State?

5. Which areas do you think are most likely to have the following rates in 1997?

    a. 25.0 _____

    b. 35.0 _____

    c. 31.0 _____

6. On what basis did you choose your answers for the question above?

What are confidence limits?

The number of births reported for an area is essentially a complete count, since more than 99% of all births are registered. While this number is not subject to sampling error, it may be affected by nonsampling errors such as mistakes in recording the mother's residence or age during the registration process.

When the number of births is used for analytic purposes — to compare rates over time, for different areas, and among different subgroups — the number of events that <u>actually</u> occurred can be thought of as one in a large series of possible results that <u>could have</u> occurred under the same circumstances. For example, the number of births that actually occurred in Baker County, Oregon, could be examined in the context of 100 counties with similar population sizes to that of Baker County (about 15,000) and with the same underlying tendency to produce live births.

When considered in this way, the number of births is subject to random variation. The probable range of values may be estimated from the actual figures according to certain statistical assumptions.

The **confidence interval** is the range of values for the number of births or birth rates that you could expect in 95 out of 100 similar counties. The **confidence limits** are the end points of this range of values (the highest and lowest values). Confidence limits enable you to determine how much "confidence" you have in the number of events or the rate in a particular place. Confidence limits tell you how much the number of events or rates could vary under similar circumstances.

Example: Confidence Limits

In Baker County, the annual number of births in 1994 was 15. How would the range of values vary among 100 counties of similar size to Baker County (that is, counties with populations of about 15,000 people)?

The **confidence interval** for Baker County based on 15 live births is from 8 births to 25 births.

The **confidence limits** are the highest (25) and lowest (8) values that could be expected in 95 out of 100 counties like Baker County. In other words, the number of live births would be greater than 25 or less than 8 in only 5 of these 100 counties.

How are confidence limits calculated for numbers of events?

Confidence limits can be estimated from the actual number of events, be they births, deaths, or some other event. Confidence limits are calculated one way if the actual number of births (or other events) is less than 100. If the number of births, or events, is 100 or greater, another formula is used. Each of these procedures is described below.

Confidence limits for numbers less than 100
When the number of events is less than 100, the confidence limits are estimated using the following formulas:

$$Lower\ limit\ =\ N\ x\ L$$

$$Upper\ limit\ =\ N\ x\ U$$

where:

N	=	the number of events
L	=	the value in Table 3 that corresponds to the number N
U	=	the value in Table 3 that corresponds to the number N

Note: Table 3 can be found at the end of this module.

Example: Confidence Limits for Numbers Less Than 100

In Baker County, the number of births in 1994 was 15.   The confidence limits for this number would be:

Lower limit =	N x L	
	=	15 x 0.55969
	=	8.4
Upper limit =	N x U	
	=	15 x 1.64935
	=	24.7

This means that the chances are 95 out of 100 that the number of births would lie between 8.4 and 24.7 or between 8 and 25 live births. In other words, if there were 100 counties like Baker County with populations of about 15,000, we would expect 95 of those counties to have numbers of births between 8 and 25. The remaining 5 counties would be expected to have numbers of births outside of that range, either less than 8 or greater than 25.

Confidence limits for numbers of 100 or more

When the number of events is greater than 100, the formulas for confidence limits are:

$$Lower\ limit\ =\quad N\ ˚\ [\ 1.96\ x\ \#N)\ ]$$

$$Upper\ limit\ =\quad N\ +\ [\ 1.96\ x\ \#N)\ ]$$

where:
N is the number of births

@ **Hint:** The square root of N (#N) is a number that when multiplied by itself will equal N . For example, the square root of 4 (#4) is 2, and the square root of 100 (#100) is 10. To calculate a square root using your calculator, enter the number and then hit the " #" key.

Example: Confidence Limits for Numbers of 100 or More

In Jackson County, the confidence interval when the number of births was 118 is:

Lower limit =	118 - [1.96 x #118]
=	118 - [1.96 x 10.86]
=	118 - 21.29
=	96.7

Upper limit =	118 + [1.96 x #118]
=	118 + [1.96 x 10.86]
=	118 + 21.29
=	139.3

So if there were 100 counties like Jackson County with populations of about 150,000, the number of births in 95 of the 100 counties would be expected to lie between 97 and 139.

How are confidence limits calculated for rates?

You can use the same assumptions to estimate the variability in birth (and death) rates. Again, one formula is used for rates based on numbers of events less than 100, and another formula for rates based on numbers of 100 or greater. For our purposes, assume that the denominators of these rates (the population estimates) have no error. While this assumption is technically correct only for denominators based on the census which occurs every 10 years, the error in intercensal population estimates is usually small, difficult to measure, and therefore not considered.

Confidence limits for rates based on less than 100 events

When the number of events in the numerator is less than 100, the confidence interval for a rate can be estimated using the two formulas which follow and the values in Table 3 (at the end of this module).

$$Lower\ limit \quad = \quad R\ x\ L$$

$$Upper\ limit \quad = \quad R\ x\ U$$

where:

R	=	the rate (birth rate, mortality rate, etc.)
L	=	the value in Table 3 that corresponds to the number N in the numerator of the rate
U	=	the value in Table 3 that corresponds to the number N in the numerator of the rate

Example: Confidence Limits for Rates Based on Less Than 100 Events

Again, in Baker County, the live birth rate for 15-17 year old women in 1994 was 45.0 per thousand, based on 15 live births in the numerator. Using Table 3:

Lower limit =   45.0 x 0.55969   =   25.2
Upper limit =   45.0 x 1.64935   =   74.2

This means that the chances are 95 out of 100 that the live birth rate in Baker County lies between 25.2 and 74.2 per 1,000. So if there were 100 counties like Baker County, the birth rate would be expected to lie between 25.2 and 74.2 per 1,000 in 95 of these counties.

Confidence limits for rates when the numerator is 100 or more

In this case, use the following formula for the rate R based on the number of events N:

$$Lower\ limit \ = \quad R\ ° \ [\ 1.96\ x\ (R\ /\ \#N)\ ]$$

$$Upper\ limit \ = \quad R\ +\ [\ 1.96\ x\ (R\ /\ \#N)\ ]$$

where:

R	=	the rate (birth rate, mortality rate, etc.)
N	=	the number of events (births, deaths, etc.)

Example: Confidence Limits for Rates Based on 100 Events or More

In Jackson Co. the live birth rate for women 15-17 was 31.0 in 1994 based on 104 live births. Therefore, the confidence interval would be:

Lower limit	=	31.0 - [1.96 x (31.0 / # 104)]
	=	31.0 - [1.96 x (31.0 / 10.20)]
	=	31.0 - [1.96 x 3.04]
	=	31.0 - 5.96
	=	25.0
Upper limit	=	31.0 + [1.96 x (31.0 / # 104)]
	=	31.0 + [1.96 x (31.0 / 10.20)]
	=	31.0 + [1.96 x 3.04]
	=	31.0 + 5.96
	=	37.0

So if there were 100 counties like Jackson County with populations of about 150,000, the birth rate would be expected to lie between 25 and 37 per 1,000 in 95 of these counties.

How are confidence limits used to determine whether two rates are "significantly" different?

Usually we are concerned about confidence limits because we want to know whether one rate is "significantly" different from another rate. The term "significantly" refers to whether or not the difference between two rates is a "true" difference — or whether the difference might have occurred by chance.

Tests of significance allow us to answer questions such as the following with a certain degree of confidence:

- Was the suicide rate for 15-24 year old males significantly different from that for females in Module 1 on Leading Causes of Death?
- Was the live birth rate for women 15-17 years old in Baker County in 1996 really different from the comparable rate in Jackson County?
- Did the birth rate for 15-17 year olds in Baker County actually decline between 1996 and 1997?

With confidence limits we are trying to specify how much confidence we can have in a given number or rate. In a similar way, with statistical significance, we are trying to specify how often we could expect to find a difference between two rates. Again, we are using the 95-out-of-100

rule, so we could think about having 100 different pairs of rates. One of the rates in each pair might come from a place with a population of 50,000 and the second rate in each pair might come from a place with a population of 200,000. Out of all of the 100 differences in rates, we are trying to determine how many differences are "**statistically significant.**"

If we find that the difference between two rates would occur due to random variability **less than 5 times out of 100,** then we say that the difference is statistically significant at the 95% level.   In essence, we are 95 percent confident that the difference is **not** due to the variability in the rates or the number of events on which the rates are based.

On the other hand, if we find that the difference would occur **more than 5 times out of 100**, then we say that the difference is **not** statistically significant. If we are only 50 percent sure, or even 94 percent sure, that the difference could not occur by chance, we usually say the that difference is not significant. We must be 95 percent certain that there is a difference when we use a 95 percent significance test.

When at least one of the rates is based on fewer than 100 events

To compare two rates, when one or both of those rates are based on less than 100 events, first compute the confidence intervals for both rates. Then check to see if those intervals overlap. If they **do** overlap, the difference is not statistically significant at the 95-percent level. If they **do not** overlap, the difference is indeed "statistically significant."

Example: Comparing Rates When One Is Based on Less Than 100 Events

Suppose you were trying to determine if the difference between the 1994 teen birth rates for Jackson and Baker Counties is statistically significant. The rate for Jackson County (31.0) is based on 104 births, while the rate for Baker County (45.0) is based on 15 births. Since one of the rates is based on less than 100 events (in this case, Baker County), you would first compute the confidence intervals for both counties. This was done earlier in Module 2:

	Lower Limit	Upper Limit
Baker County	25.2	74.2
Jackson County	25.0	37.0

You discover that these two confidence intervals overlap; in fact, the interval for Jackson County lies almost entirely within the range of the interval for Baker County. Therefore, the difference between the live birth rate for women 15-17 in Baker County and the rate for Jackson County in 1994 (45.0 - 31.0 = 14.0) is not statistically significant.

When both rates are based on 100 or more events

If you are comparing rates that are both based on 100 or more events, first calculate the difference between the two rates by subtracting the lower rate from the higher rate. This difference is considered statistically significant if it **exceeds** the statistic in the formula below. This statistic equals 1.96 times the standard error for the difference between two rates.

$$1.96 \sqrt{\frac{R_1^2}{N_1} + \frac{R_2^2}{N_2}}$$

where:

R_1	=	the first rate
R_2	=	the second rate
N_1	=	the first number of births
N_2	=	the second number of births

- If the difference is **greater** than this statistic, then the difference would occur by chance less than 5 times out of 100. We say it is statistically significant at the 95-percent confidence level.

- If the difference is **less** than this statistic, the difference might occur by chance more than 5 times out of 100. We say that the difference is not statistically significant at the 0.05 level.

Example: Comparing Rates When Both Are Based on 100 or More Events

Suppose we want to know if the difference between the live birth rate for 15-17 year old women in Oregon in 1985 (22.8) and the comparable rate for Oregon in 1996 (30.7) is statistically significant. Both rates are based on more than 100 births (1,349 in 1985 and 2,015 in 1996). The difference between the rates is 30.7 - 22.8 = 7.9. The statistic is then calculated as follows:

$$1.96 \sqrt{\frac{22.8^2}{1,349} + \frac{30.7^2}{2,015}}$$

$$= \quad 1.96 \ \text{x} \ [(519.84/1,349 \ + \ 942.49/2,015)]$$
$$= \quad 1.96 \ \text{x} \ \#(0.385 \ + \ 0.468)$$
$$= \quad 1.96 \ \text{x} \ \#0.853$$
$$= \quad 1.96 \ \text{x} \ .92$$
$$= \quad 1.80$$

The difference between the rates (7.9) is greater than this statistic (1.8). Therefore, the difference is indeed statistically significant. This means that we would expect a difference of 7.9 between these two rates to occur less than 5 times out of every 100 similar comparisons simply because of the variability in the two rates.

Exercise 6: Determining Significance

Instructions: In this exercise you will use data from Burrows County to practice calculating confidence limits and intervals. You will also examine two rates to determine if their difference is statistically significant.

1. What are the confidence limits for the number of teen pregnancies in Burrows County in 1997? Show your answers with two decimal places and then round to the nearest whole numbers. [As a reminder, the number of teen pregnancies in Burrows County in 1997 was 439.]

2. What is the confidence interval for the teen pregnancy rate in Burrows County in 1997? Again, show your answer with two decimal places. [The teen pregnancy rate in Burrows County in 1997 was 47.1.]

3. Was the decrease in the teen pregnancy rate in Burrows County from 1996 to 1997 statistically significant? Round to two decimal places one more time. [The teen pregnancy rate in Burrows County in 1996 was 51.1.]

> **You have now completed Module 2.**
> **Begin Module 3 when you are ready.**

Table 3.
Values of Lower (*L*) and Upper (*U*) Limits for Calculating 95% Confidence Limits for
Numbers of Events and Rates When the Number of Events Is Less Than 100

N	L	U	N	L	U
1	0.02532	5.57164	50	0.74222	1.31838
2	0.12110	3.61234	51	0.74457	1.31482
3	0.20622	2.92242	52	0.74685	1.31137
4	0.27247	2.56040	53	0.74907	1.30802
5	0.32470	2.33367	54	0.75123	1.30478
6	0.36698	2.17658	55	0.75334	1.30164
7	0.40205	2.06038	56	0.75539	1.29858
8	0.43173	1.97040	57	0.75739	1.29562
9	0.45726	1.89831	58	0.75934	1.29273
10	0.47954	1.83904	59	0.76125	1.28993
11	0.49920	1.78928	60	0.76311	1.28720
12	0.51671	1.74680	61	0.76492	1.28454
13	0.53246	1.71003	62	0.76669	1.28195
14	0.54671	1.67783	63	0.76843	1.27943
15	0.55969	1.64935	64	0.77012	1.27698
16	0.57159	1.62394	65	0.77178	1.27458
17	0.58254	1.60110	66	0.77340	1.27225
18	0.59266	1.58043	67	0.77499	1.26996
19	0.60207	1.56162	68	0.77654	1.26774
20	0.61083	1.54442	69	0.77806	1.26556
21	0.61902	1.52861	70	0.77955	1.26344
22	0.62669	1.51401	71	0.78101	1.26136
23	0.63391	1.50049	72	0.78244	1.25933
24	0.64072	1.48792	73	0.78384	1.25735
25	0.64715	1.47620	74	0.78522	1.25541
26	0.65323	1.46523	75	0.78656	1.25351
27	0.65901	1.45495	76	0.78789	1.25165
28	0.66449	1.44528	77	0.78918	1.24983
29	0.66972	1.43617	78	0.79046	1.24805
30	0.67470	1.42756	79	0.79171	1.24630
31	0.67945	1.41942	80	0.79294	1.24459
32	0.68400	1.41170	81	0.79414	1.24291
33	0.68835	1.40437	82	0.79533	1.24126
34	0.69253	1.39740	83	0.79649	1.23965
35	0.69654	1.39076	84	0.79764	1.23807
36	0.70039	1.38442	85	0.79876	1.23652
37	0.70409	1.37837	86	0.79987	1.23499
38	0.70766	1.37258	87	0.80096	1.23350
39	0.71110	1.36703	88	0.80203	1.23203
40	0.71441	1.36172	89	0.80308	1.23059
41	0.71762	1.35661	90	0.80412	1.22917
42	0.72071	1.35171	91	0.80514	1.22778
43	0.72370	1.34699	92	0.80614	1.22641
44	0.72660	1.34245	93	0.80713	1.22507
45	0.72941	1.33808	94	0.80810	1.22375
46	0.73213	1.33386	95	0.80906	1.22245
47	0.73476	1.32979	96	0.81000	1.22117
48	0.73732	1.32585	97	0.81093	1.21992
49	0.73981	1.32205	98	0.81185	1.21868
			99	0.81275	1.21746