



Candice's Quick & Dirty Slides on Descriptive Data & Visual Presentations.

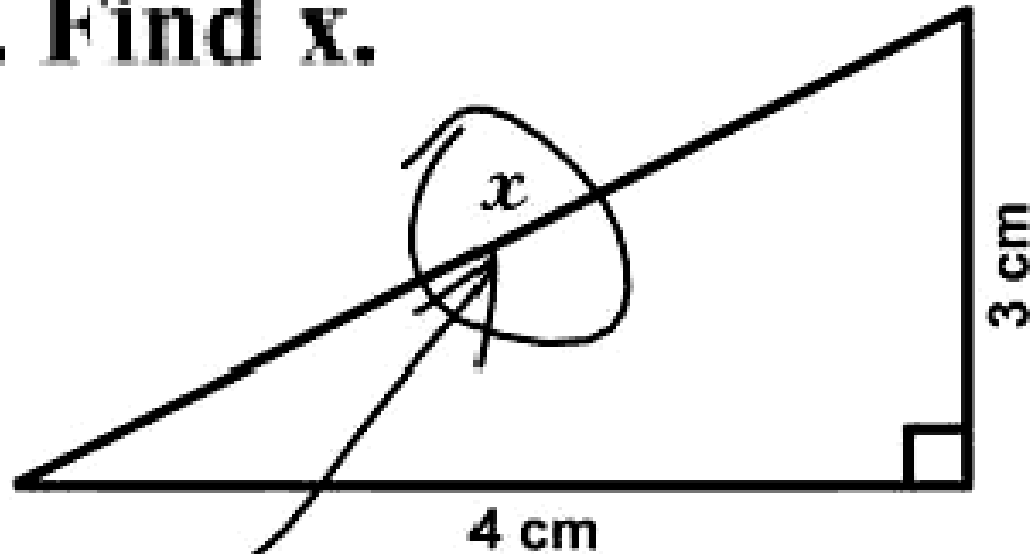
**SHIELD Research Methods
Class #2: November 18, 2016
Candice Belanoff, ScD, MPH**



I. Calculations for population measures

Calculations

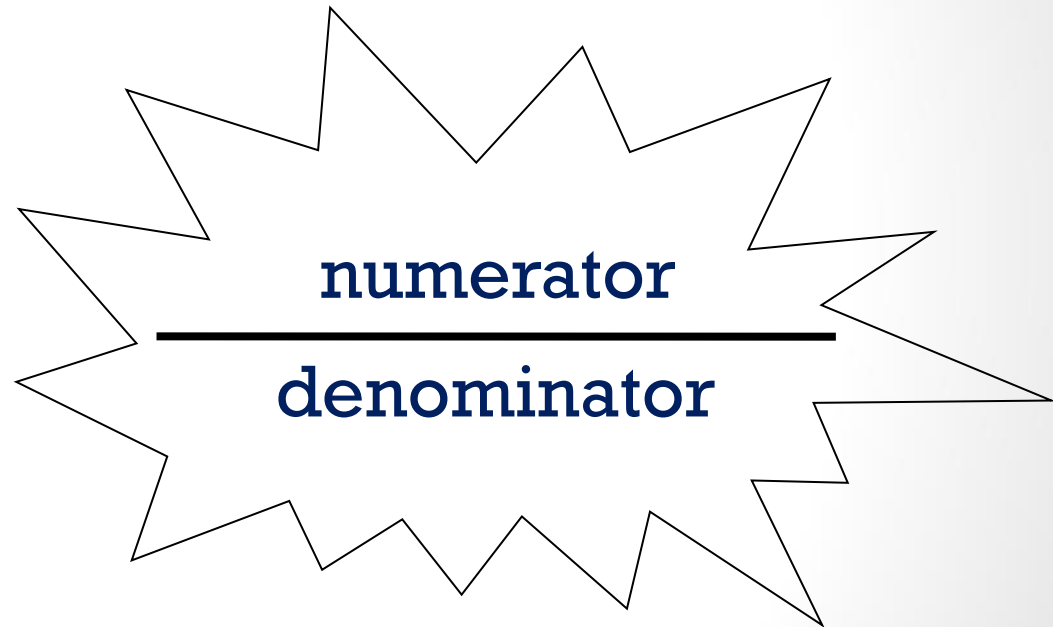
3. Find x .



Here it is

Calculations for population measures

- **Bear in mind:**
 - Who/what is in there?
 - Does this tell me something about
 - Risk of disease*?
 - overall burden of disease?
 - Something else (like a comparison of risk across two groups?)



**“Disease” = Any outcome of interest*

Calculations – Counts, Ratios, Proportions, Rates

- **What information do we have?**

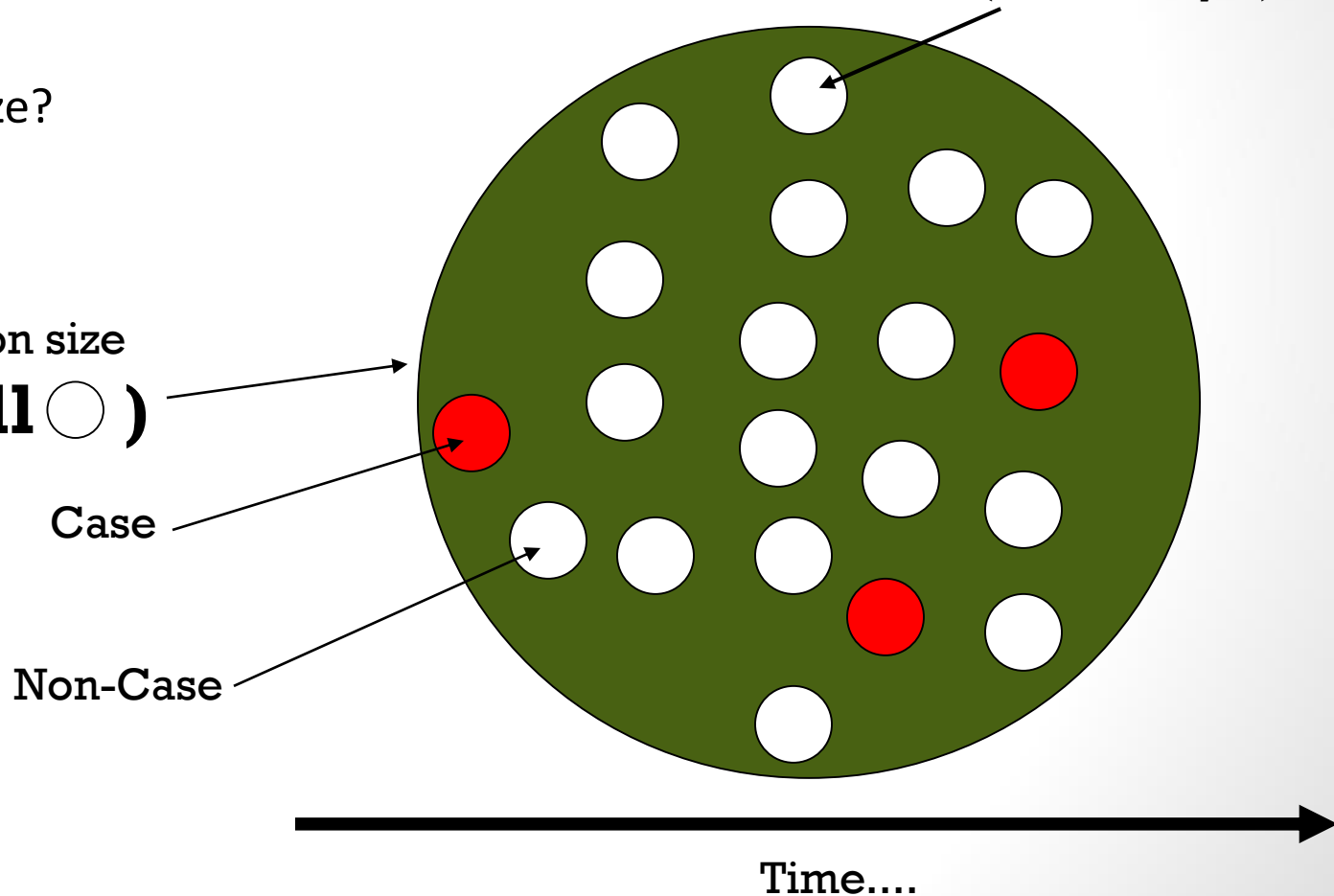
- How many cases?
- Non-cases?
- Population size?
- Time?

Total population size
(**all** ● + **all** ○)

Case

Non-Case

Developing case
(unknown yet)

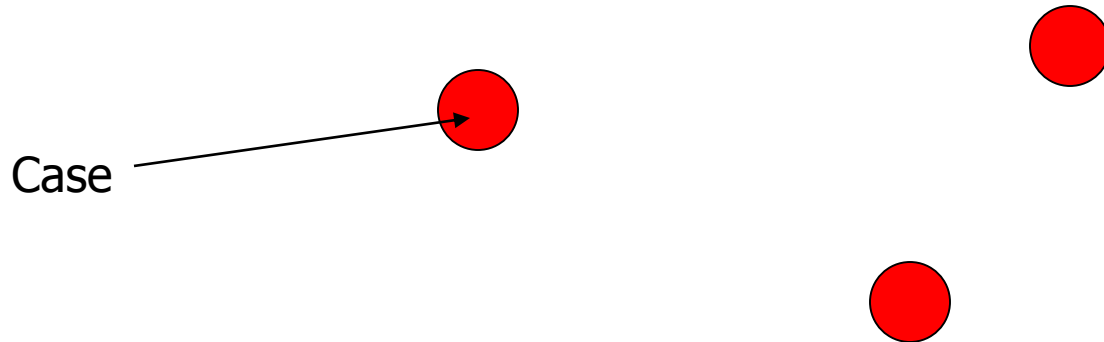


Calculations – Counts, Ratios, Proportions, Rates

- **Count**

- **Range: 0 to ∞**

Total cases = 3



Calculations – Counts, Ratios, Proportions, Rates

- **Count Data**

H1N1 influenza....



“As of August 13, 2009, 1,387 confirmed cases of H1N1 have been reported throughout Massachusetts.”

Source:

*Massachusetts Department of Public Health
<http://ma-publichealth.typepad.com/files/pdfweeklyrept.pdf>*

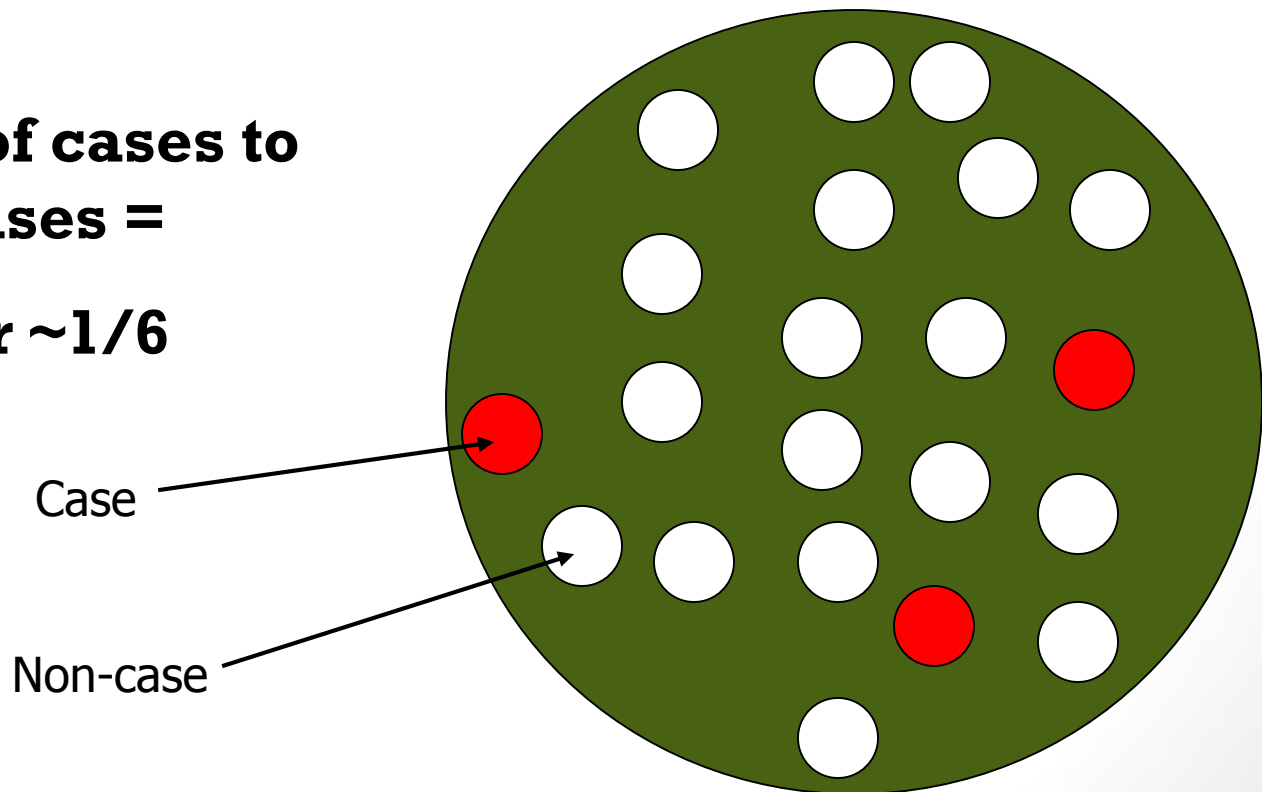
Calculations – Counts, Ratios, Proportions, Rates

- **Ratio** = one number divided by another
(but not necessarily members of same group)

- Range: 0 to ∞

**Ratio of cases to
non-cases =**

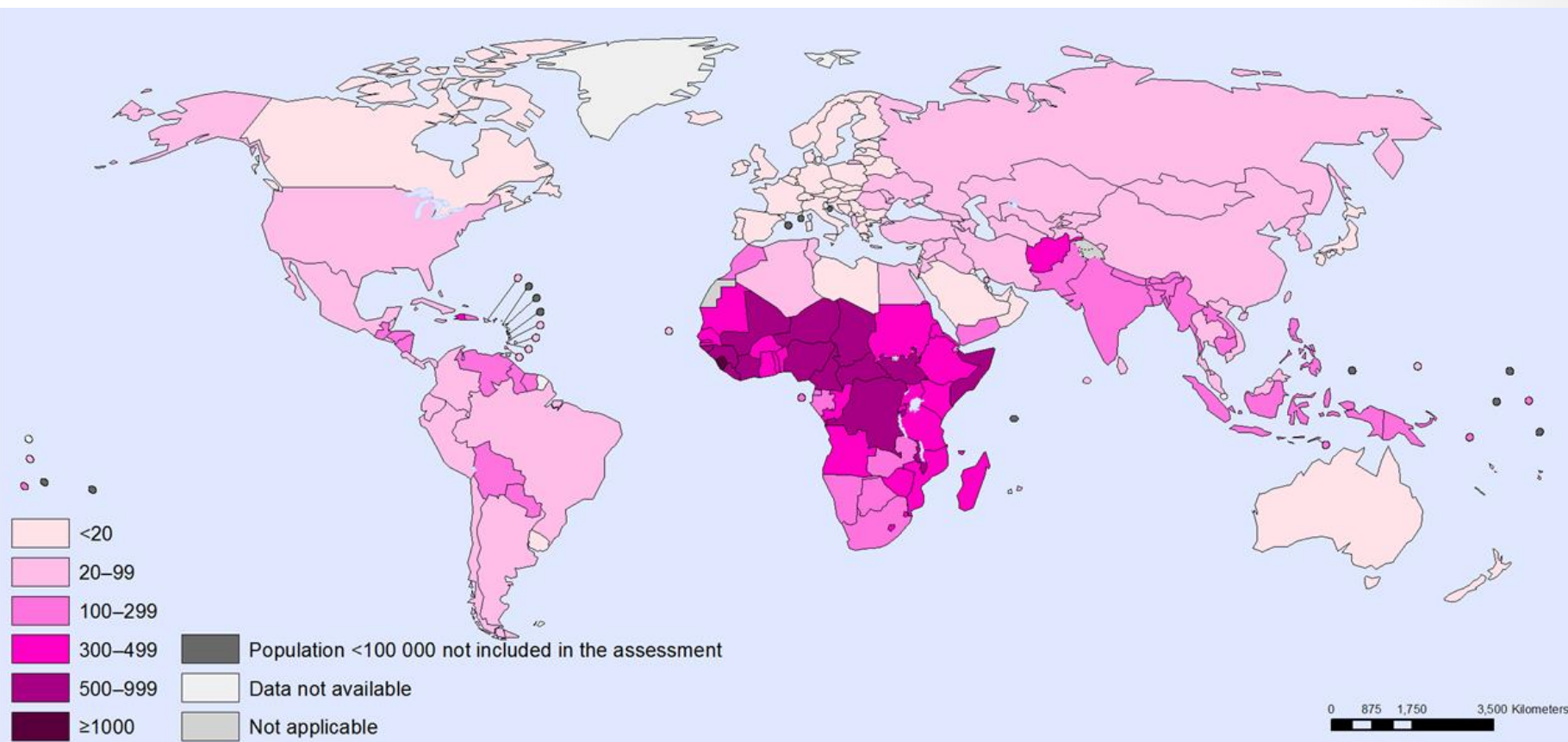
3/18 or $\sim 1/6$



Calculations – Counts, Ratios, Proportions, Rates

• Ratio

**Example: Maternal Mortality Ratio (MMR):
maternal deaths/100,000 live births, 2013**



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Health Statistics and
Information Systems (HSI)
World Health Organization



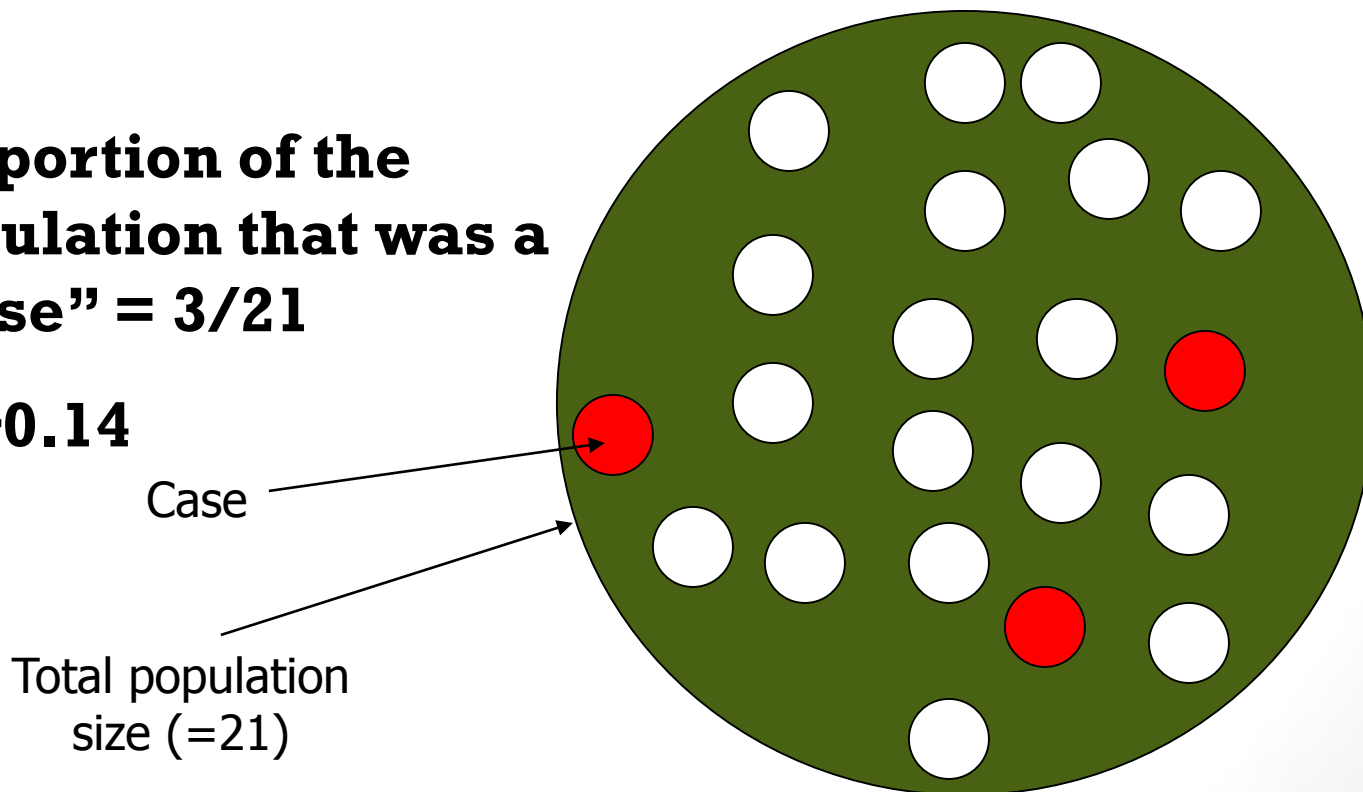
© WHO 2014. All rights reserved.

Calculations – Counts, Ratios, Proportions, Rates

- **Proportion** = one number divided by another (where numerator always a subset of the denominator)
 - Range: 0 to 1 (or 0%-100%)

Proportion of the population that was a “case” = $3/21$

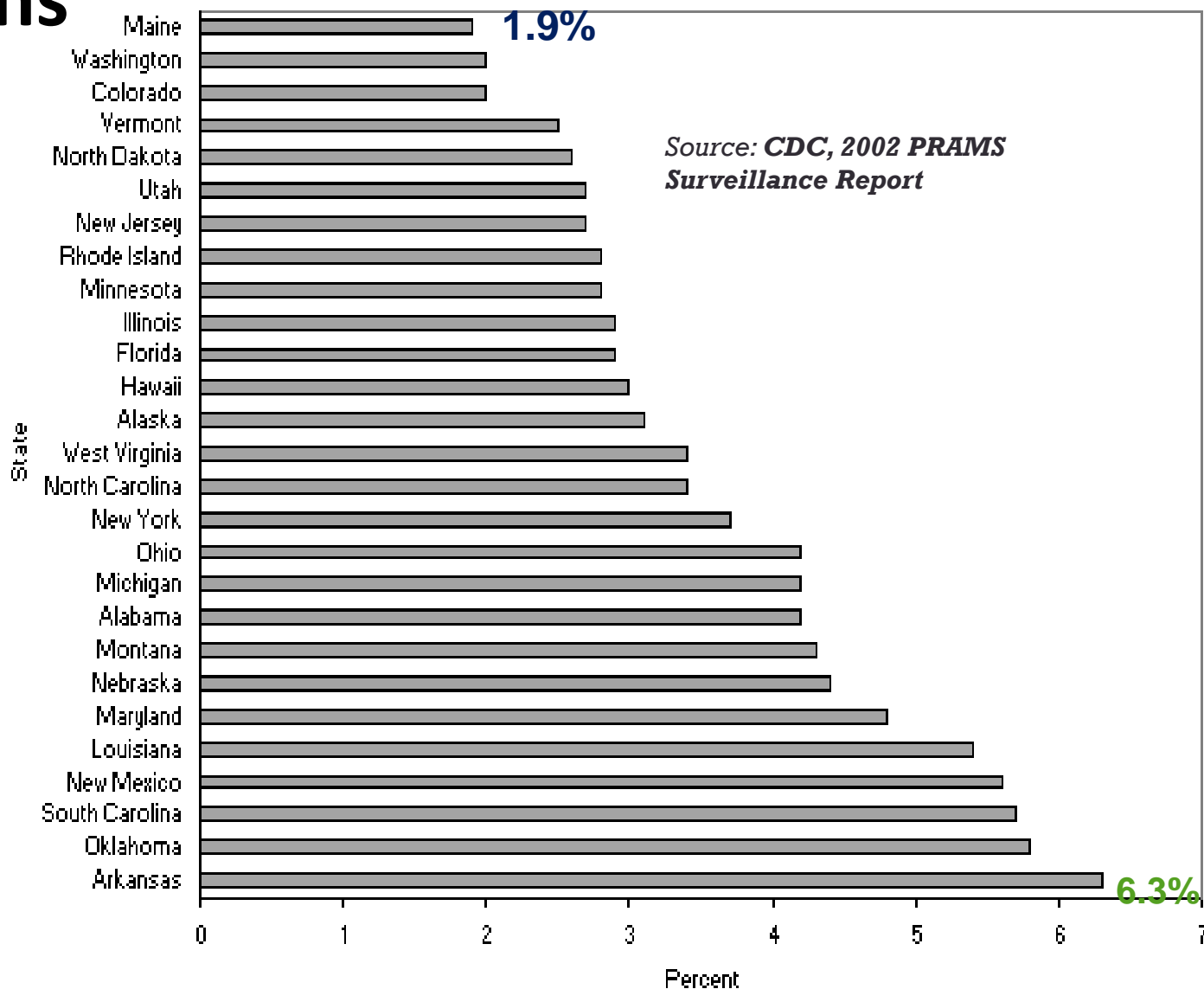
or ~ 0.14



Calculations – Counts, Ratios, Proportions, Rates

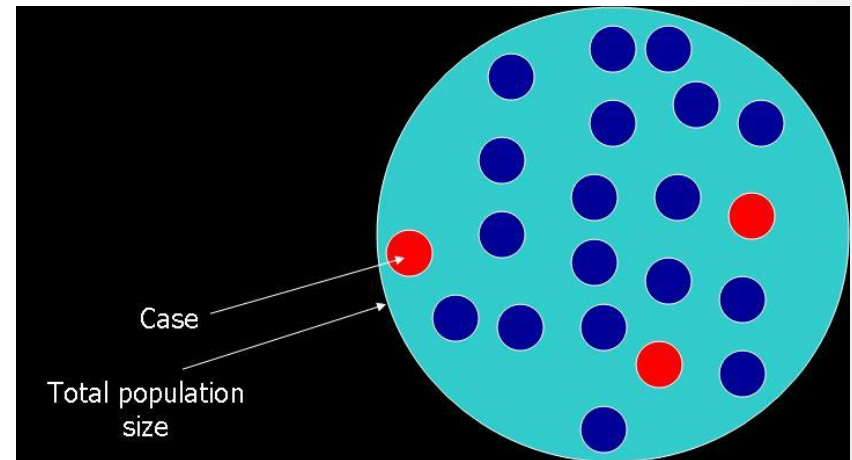
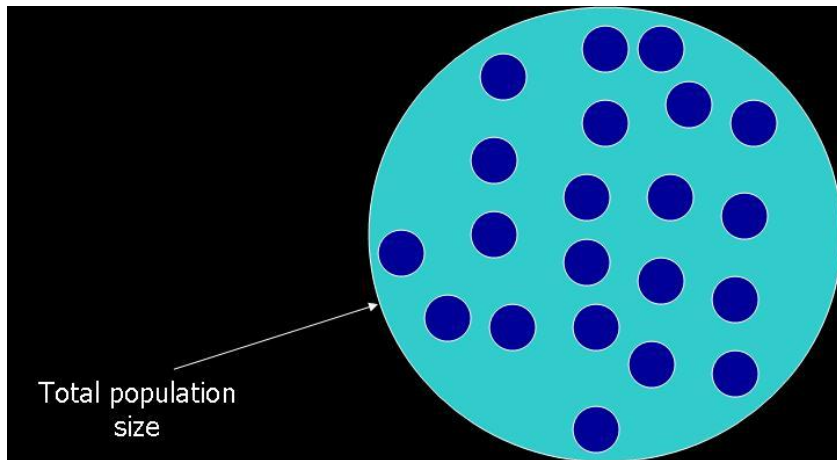
- **Proportions**

Example:
Proportion (%)
of survey
respondents
reporting
intimate
partner
violence (IPV)
during most
recent
pregnancy
(data from
PRAMS, 2002)



Calculations – Counts, Ratios, Proportions, Rates

- **Rate** = one number divided by another with time in the denominator. Rates presume that all subjects that you follow are disease-free at the beginning of surveillance.
- Range: 0 to ∞



One Year....



Rate of cases occurring =

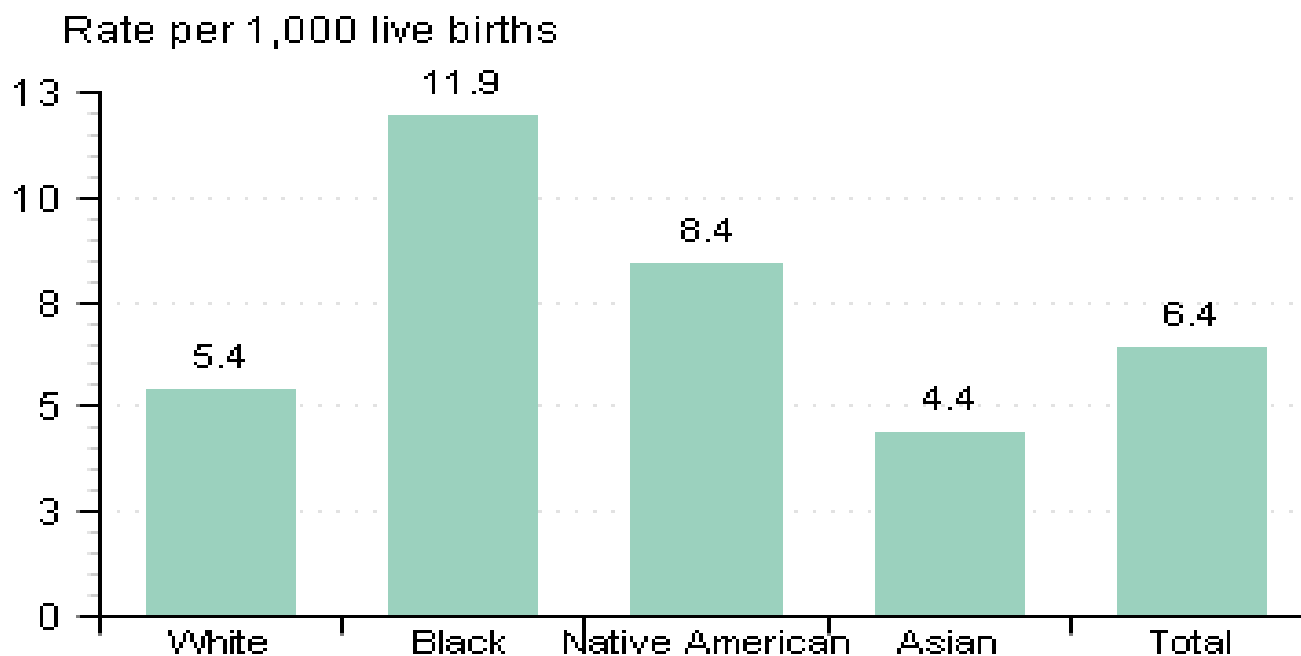
* $3/21$, per year.... Which converts to
140 per 1,000 people, per year

Calculations – Counts, Ratios, Proportions, Rates

- **Rate**

Example: Infant Mortality Rate (IMR):

infant deaths/1000 live births, per year



Source: March of Dimes, Peristats, using National Center for Health Statistics, iperiod Inked birth/infant death data, 2008-2010 averages.

Calculations

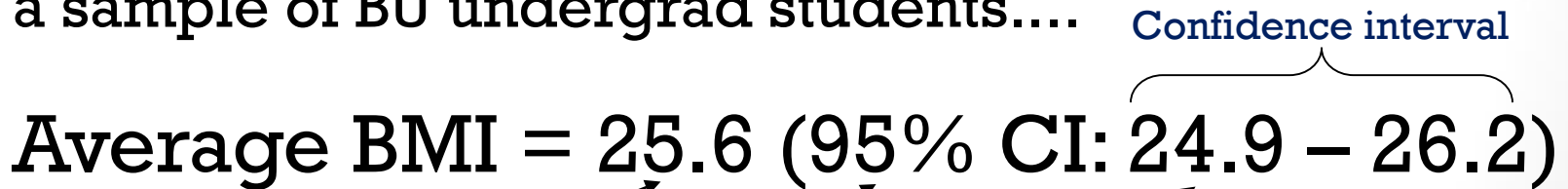
- **What is a 95% confidence interval???**
 - What does it mean?
 - What does it tell us?

What is a 95% confidence interval???

- **Technically speaking:** If a study were repeated 100 times and there were 100 point estimates and CI's generated, 95 of them could contain the true point estimate. 5% wouldn't
- **Most folks use a looser definition** (if technically/statistically incorrect) that we are 95% confident that the true point estimate lies between these two parameters...
- Calculated using point estimate and standard error
- Width of the CI: **precision** of estimate & confidence level in point est.
- For measures of occurrence or association

Example: A study is looking at BMI among a sample of BU undergrad students....

Average BMI = 25.6 (95% CI: 24.9 – 26.2)



Point estimate

Confidence level

Confidence limits

II. Measures of disease/event/condition occurrence: Incidence and Prevalence

• Incidence

- Occurrence of *new disease* within eligible population....

- **Requires:**

- Pool of eligible subjects:
 - e.g. shouldn't calculate incidence of uterine cancer in the *total* adult population. Why?
Because people born without a uterus are not eligible.
 - Subjects start disease-free
- Following subjects through time

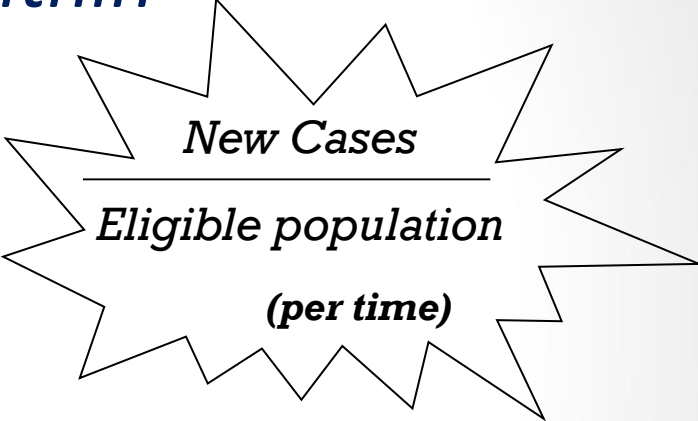
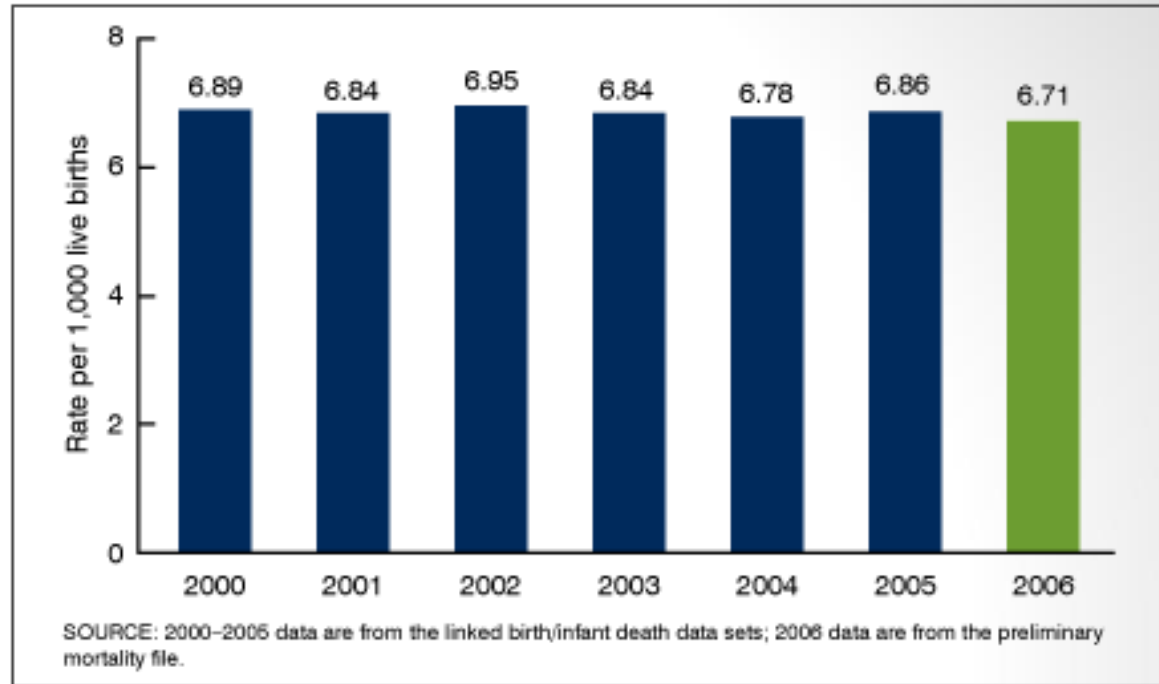

$$\frac{\text{New Cases}}{\text{Eligible population}} \text{ (per time)}$$

Figure 1. Infant mortality rate: United States, 2000–2005, and 2006 preliminary

- **Incidence**

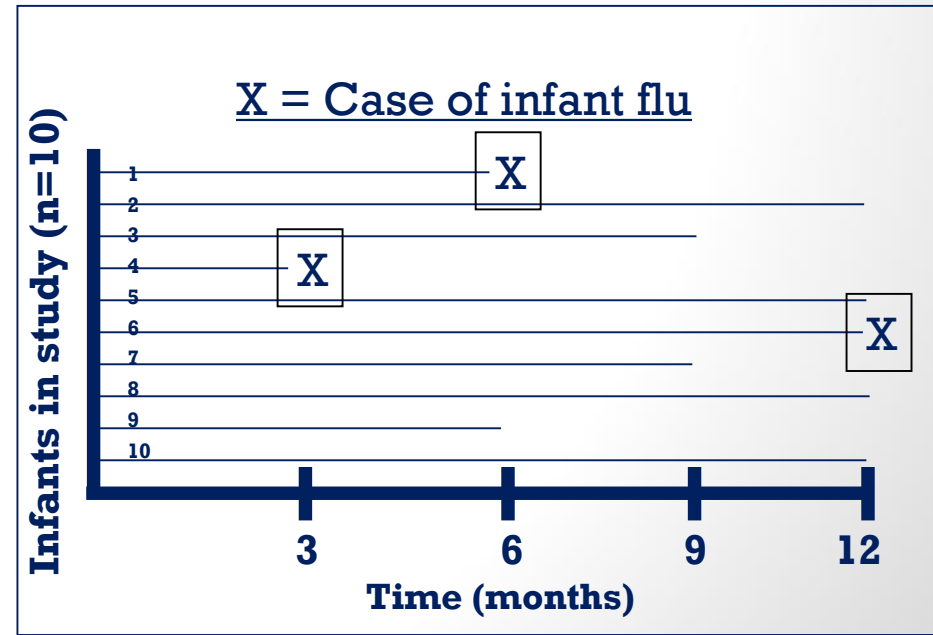
- **Cumulative Incidence**

- Example:
- # infant deaths/1,000 live births, in one year
- New cases/eligible pop. (for a given time period.)
- Better for stable/non-changing population



- **Incidence rate**

- New cases/time at risk for outcome ("person-time")
- Good for dynamic population (when people come & go)
- Example: 3 cases/93 person-months at risk



• Prevalence

- Already existing disease or condition in the population
- Doesn't account for when disease first occurred
- Doesn't account for how long the disease or condition lasts
- Is not a direct measure of risk


$$\frac{\textit{Existing Cases}}{\textit{Eligible population}}$$

*Prevalence is a product
of Incidence x Duration*

- **Prevalence** (basically a percent or some other proportion)

- **Point prevalence** (point in time)

- *Example: Proportion of Massachusetts residents living with HIV right now.*

- **Period prevalence** (period of time)

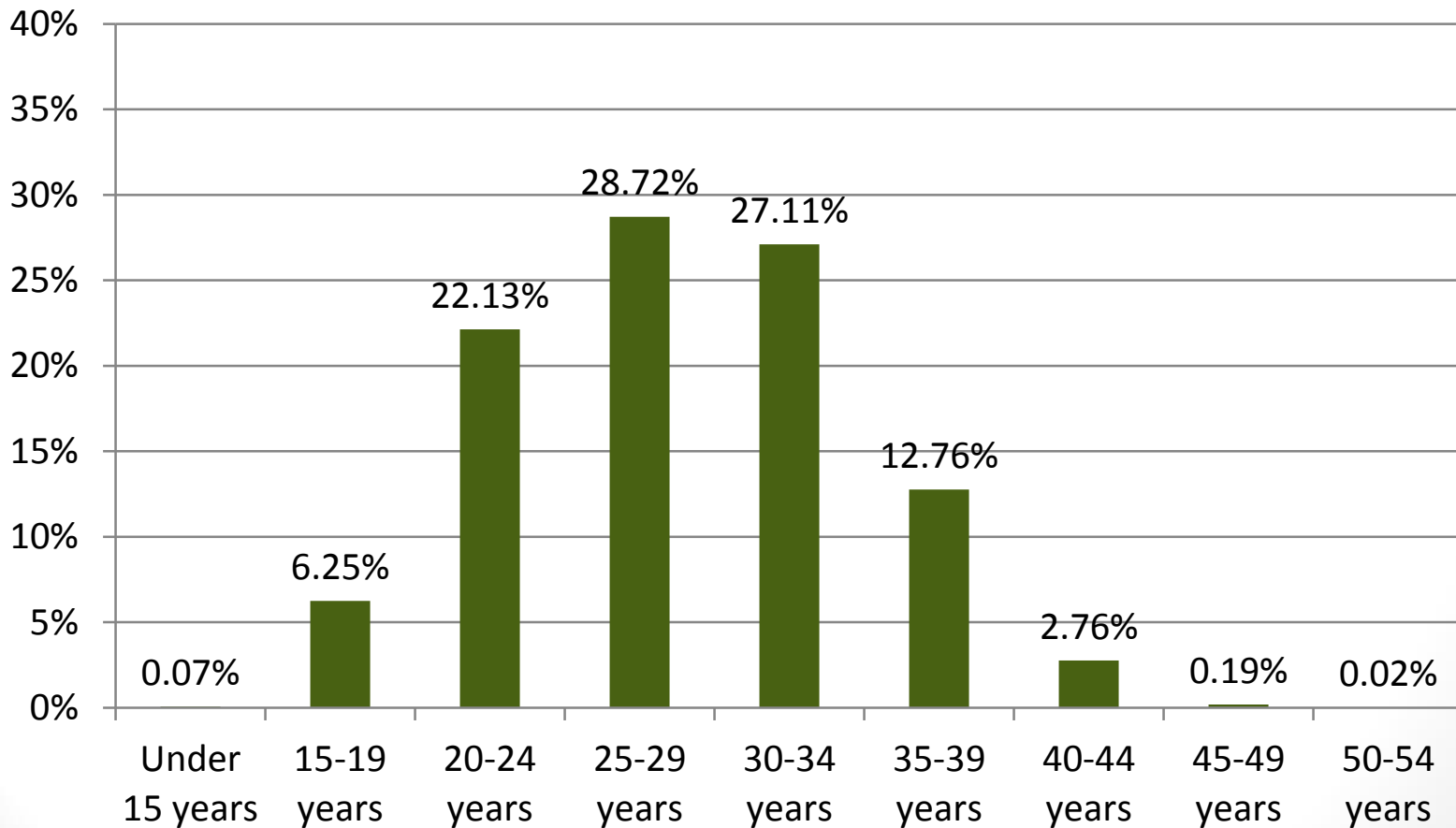
- *Example: Proportion of Massachusetts residents who were living with HIV at any point during the year.*

Descriptive Data: Presenting population distributions

- If you want a “snapshot” of what a population looks like at a given time, you may want to produce a population distribution....

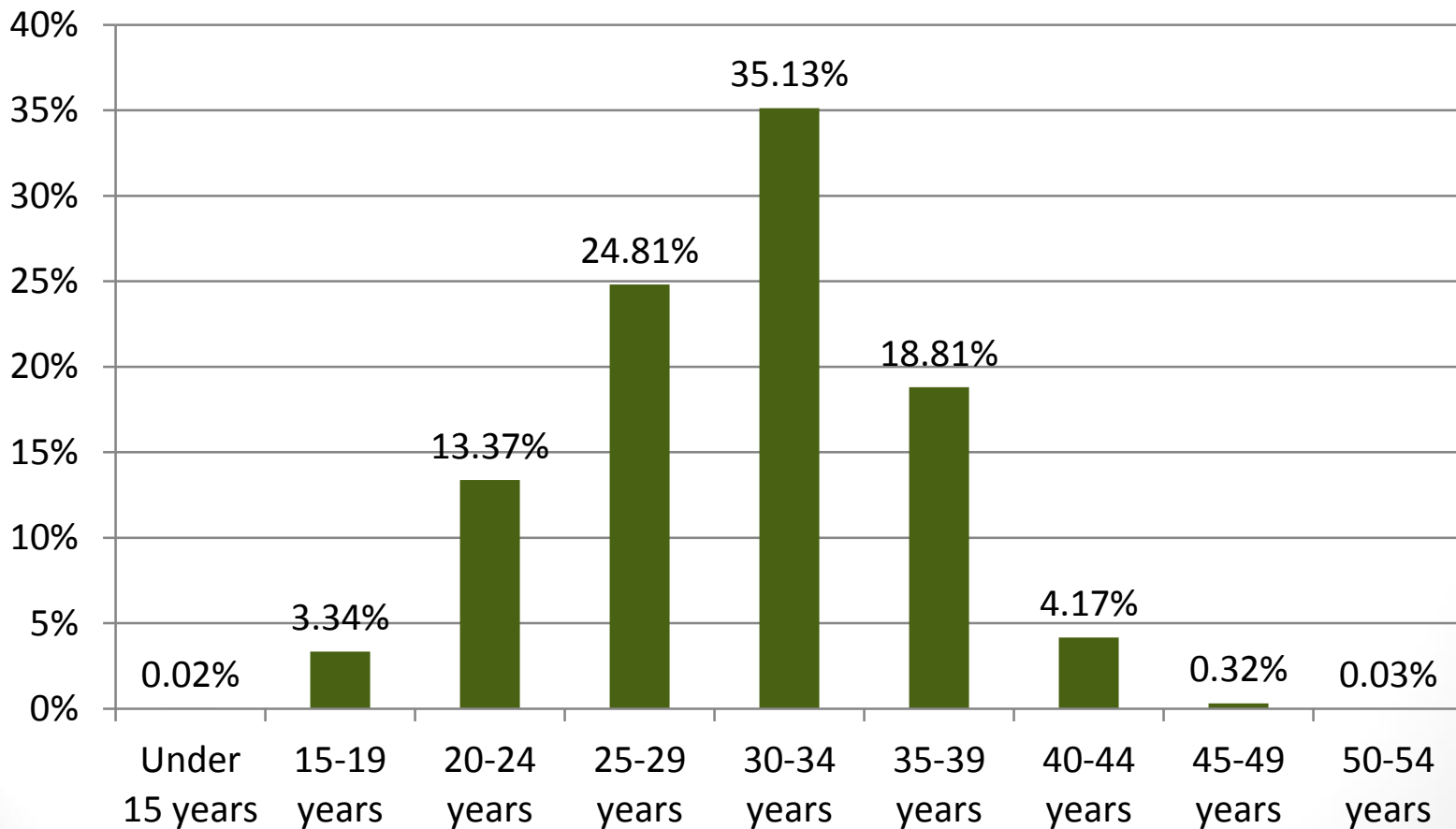
Descriptive Data: Presenting population distributions

Distribution of U.S. births by maternal age, 2014



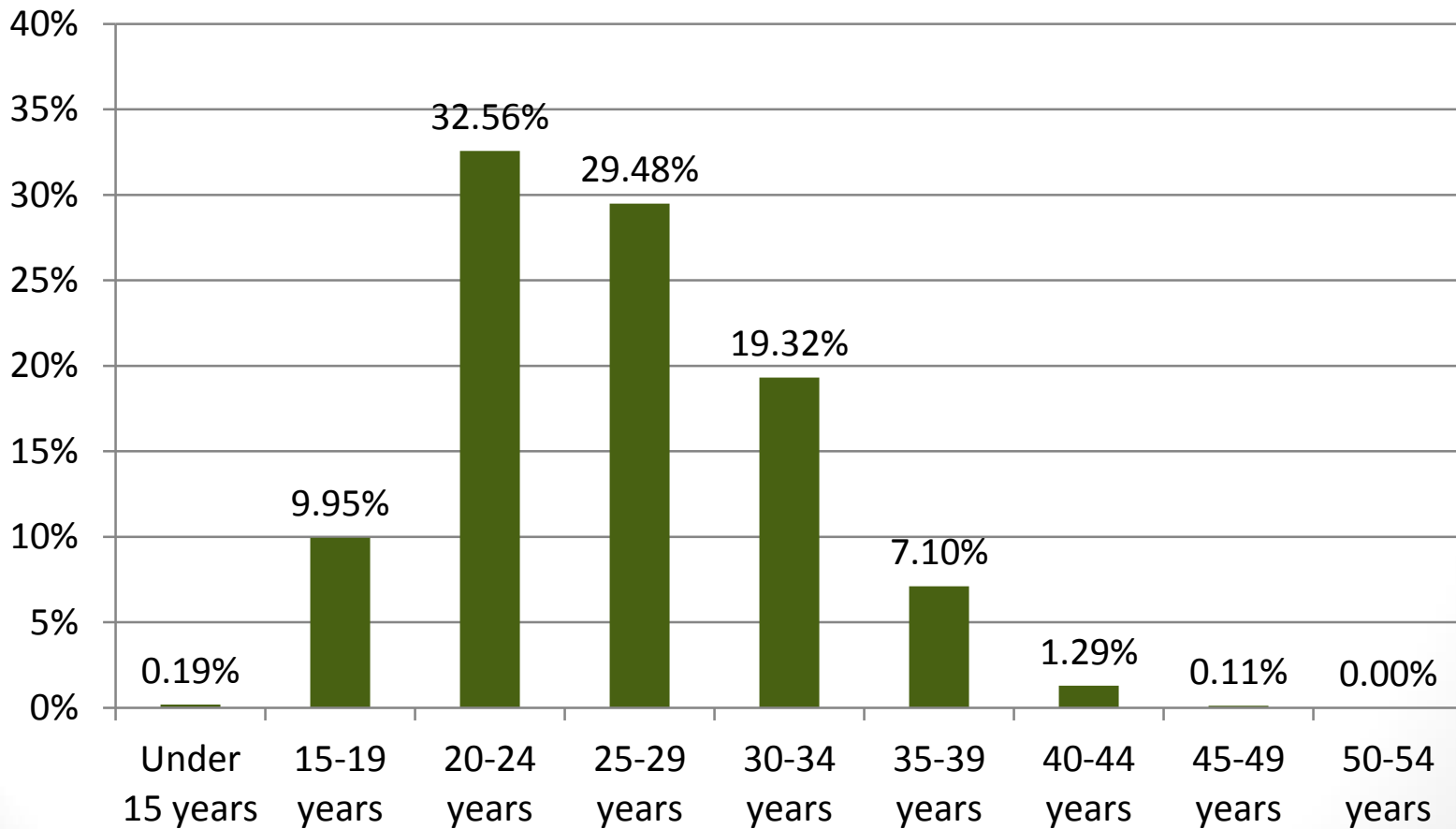
Descriptive Data: Presenting population distributions

Distribution of MA births by maternal age, 2014



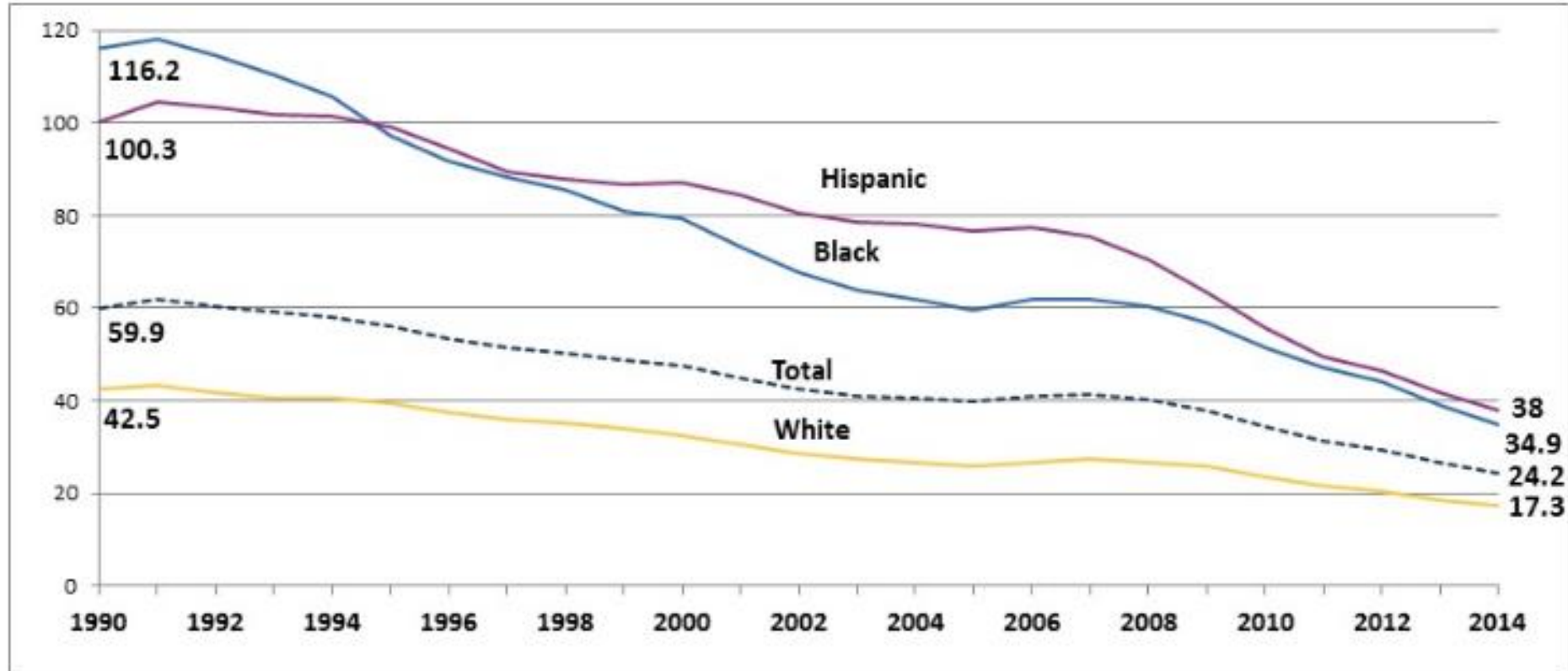
Descriptive Data: Presenting population distributions

Distribution of MS births by maternal age, 2014



Descriptive Data: Presenting Time Trends

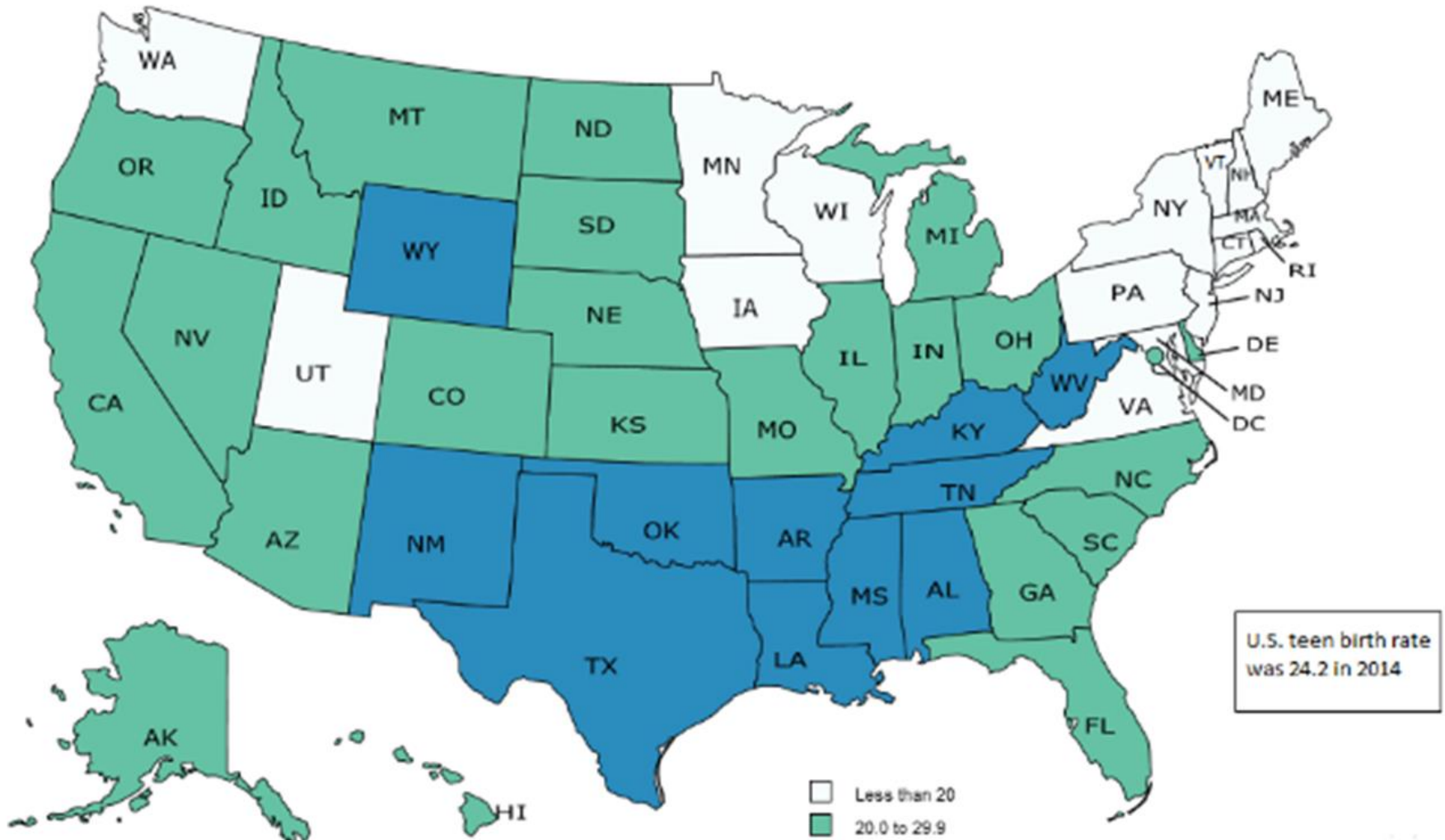
Figure 1: Birth rates per 1,000 females ages 15-19, by race/ethnicity, 1990-2014



<http://www.hhs.gov/ash/oah/adolescent-health-topics/reproductive-health/teen-pregnancy/trends.html>

Descriptive Data: Presenting Geographic Trends

Figure 2: Teenage birth rates for 15 – 19 year olds by state, 2014



Source: Martin, J. A., Hamilton, B. E., Ventura, S. J., & Osterman, M. J. K. S.C., & Mathews, T.J (2015). *Births: Final data for 2014*. Hyattsville, MD: National Center for Health Statistics.

Tables, rows and columns, totals and percentages.

(A timeless scourge of the quantitative researcher....)

Tables, rows and columns, totals and percentages.

Data source: United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Division of Vital Statistics, Natality public-use data 2007-2014, on CDC WONDER Online Database, February 2016.

Table 1. Births to people under 20 years of age, by age and race, US, 2014.

RACE	<15	15-19	Total
American Indian or Alaska Native	55	5,001	5,056
Asian or Pacific Islander	40	4,637	4,677
Black or African American	1,028	59,951	60,979
White	1,646	179,489	181,135
Total	2,769	249,078	251,847

Q: How many AIAN teens total gave birth in 2014?

Q: How many teens under 15 total gave birth in 2014?

RACE	<15	15-19	Total
American Indian or Alaska Native	55	5,001	
Asian or Pacific Islander	40	4,637	
Black or African American	1,028	59,951	
White	1,646	179,489	
Total			

Q: How many AIAN teens total gave birth in 2014?

RACE	<15	15-19	Total
American Indian or Alaska Native	55	5,001	5,056
Asian or Pacific Islander	40	4,637	4,677
Black or African American	1,028	59,951	60,979
White	1,646	179,489	181,135
Total			

Q: How many teens under 15 total gave birth in 2014?

RACE	<15	15-19	Total
American Indian or Alaska Native	55	5,001	
Asian or Pacific Islander	40	4,637	
Black or African American	1,028	59,951	
White	1,646	179,489	
Total	2,769	249,078	

Row totals and column totals

(together at last...)

RACE	<15	15-19	Total
American Indian or Alaska Native	55	5,001	5,056
Asian or Pacific Islander	40	4,637	4,677
Black or African American	1,028	59,951	60,979
White	1,646	179,489	181,135
Total	2,769	249,078	251,847

Q: What percent of all AIAN teen births were to teens under 15? (Row percentage)

RACE	<15	15-19	Total
American Indian or Alaska Native	1.09%	98.91%	100.00%
Asian or Pacific Islander	0.86%	99.14%	100.00%
Black or African American	1.69%	98.31%	100.00%
White	0.91%	99.09%	100.00%
Total	1.10%	98.90%	100.00%

Q: What percent of all <15 births were to AIAN teens?

RACE	<15	15-19	Total
American Indian or Alaska Native	1.99%	2.01%	2.01%
Asian or Pacific Islander	1.44%	1.86%	1.86%
Black or African American	37.13%	24.07%	24.21%
White	59.44%	72.06%	71.92%
Total	100.00%	100.00%	100.00%

To Be Continued....