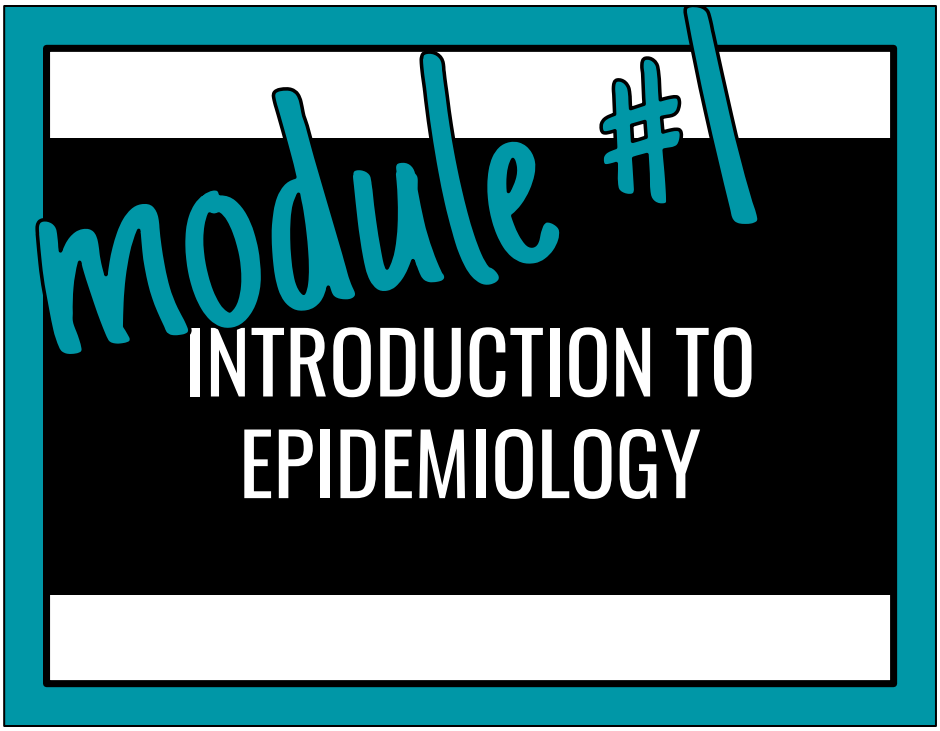

module #1
INTRODUCTION TO
EPIDEMIOLOGY

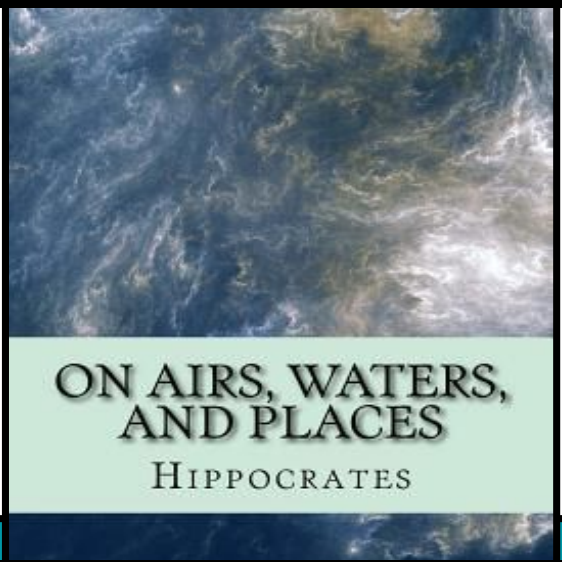
LESSON #1
Learning Outcomes

1. Define epidemiology
2. Explain the goals and key concepts of epidemiology
3. Describe how epi data has been used by public health

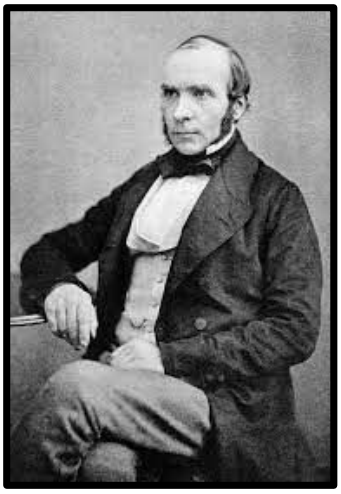
EPIDEMIOLOGY

The study of how disease is distributed in populations and of the factors that influence or determine the distribution of disease.

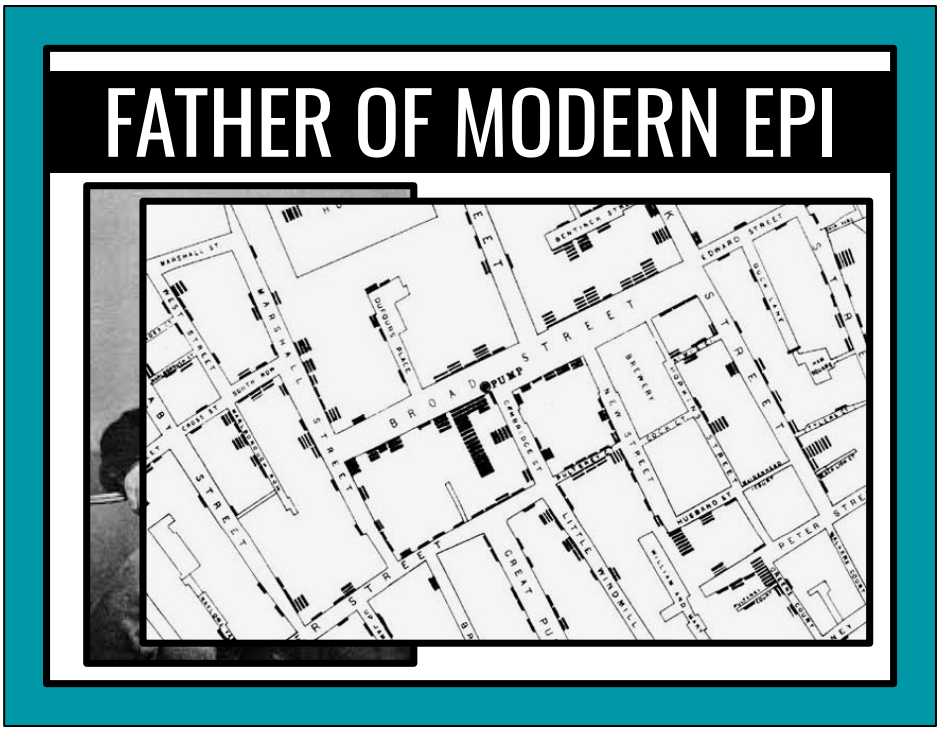
EARLY HISTORY



FATHER OF MODERN EPI



More about John Snow –
https://www.britannica.com/biography/John-Snow-British-physician



More about the John Snow Pub in London (including a replica of the Broad Street pump) – https://londonist.com/pubs/pubs/pubs/john-snow

GOALS OF EPIDEMIOLOGY

1. Prevent
2. Diagnose (early)
3. Return to health

More information on primary, secondary, & tertiary prevention – https://www.iwh.on.ca/what-researchers-mean-by/primary-secondary-and-tertiary-prevention

GOALS OF EPIDEMIOLOGY

1. Prevent primary
2. Diagnose (early)
3. Return to health

GOALS OF EPIDEMIOLOGY

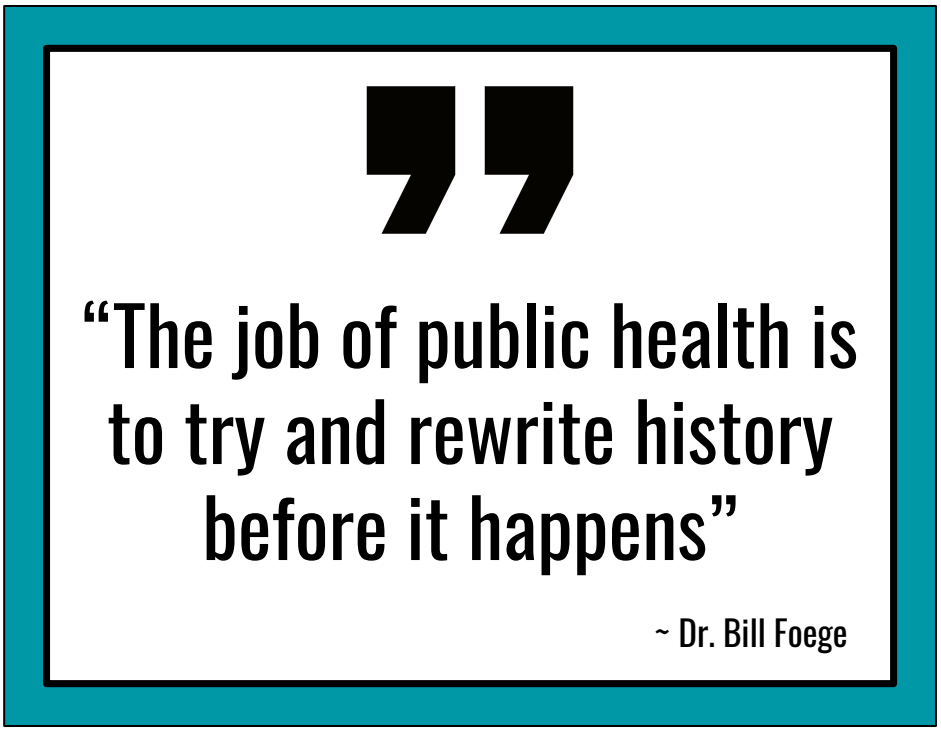
1. Prevent
2. Diagnose (early)
3. Return to health

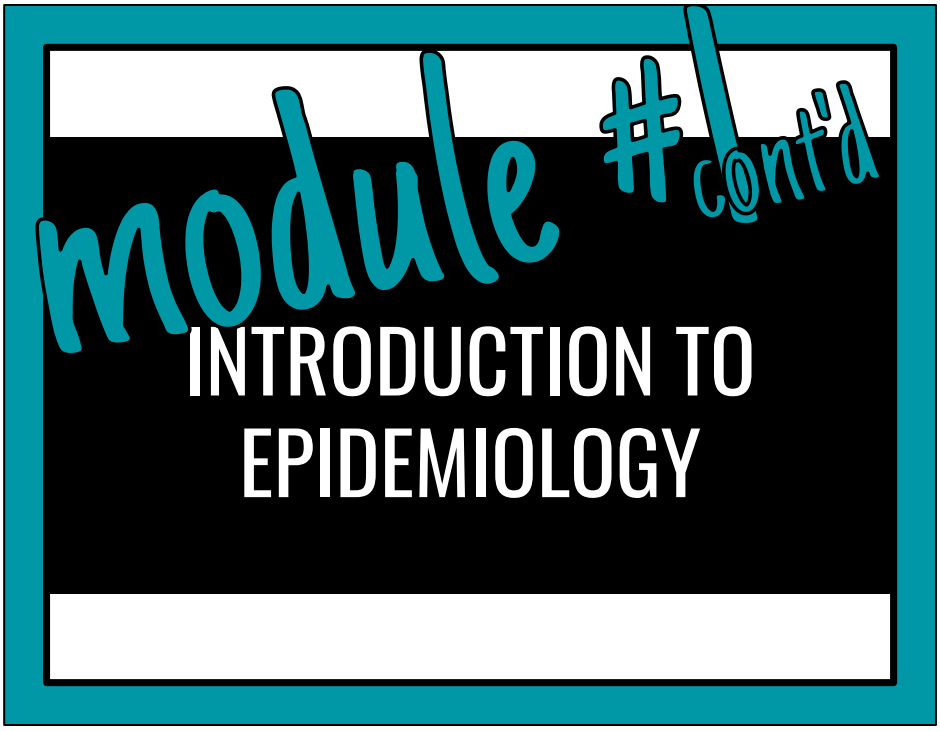
secondary

GOALS OF EPIDEMIOLOGY

1. Prevent
2. Diagnose (early)
3. Return to health

tertiary


”
“The job of public health is to try and rewrite history before it happens”
~ Dr. Bill Foege


module #1 cont'd
INTRODUCTION TO
EPIDEMIOLOGY

Introducing the purple slides! Any slide that is framed in purple is a practice problem (or a practice problem solution/interpretation). When you see a purple framed slide, it is an indication that you should pause the video so that you can attempt the practice problem on your own. Once you have given the problem a try, start the video again to see how to make the calculation or provide an appropriate interpretation. Remember – we learn the most when we try something on our own. Watching is not learning.

EPIDEMIOLOGY

The study of how disease is distributed in populations and of the factors that influence or determine the distribution of disease.

EPIDEMIOLOGY

The study of how diseases distribute in populations and factors that influence or determine the distribution of disease.

quantitative science

MEASURING DISEASE

1. Ratios
2. Proportions
3. Rates

More information & practice problems for rates, ratios, and proportions
https://www.khanacademy.org/test-prep/sat/x0a8c2e5f:untitled-652/x0a8c2e5f:problem-solving-and-data-analysis-lessons-by-skill/a/gtp--sat-math--article--ratios-rates-and-proportions--lesson#:~:text=A%20proportion%20is%20an%20equality,and%20solve%20for%20unknown%20quantities.&text=A%20rate%20is%20the%20quotient,the%20quantities%20have%20different%20units.

RATIO

Expression of relationship between two distinct (non-overlapping) groups – something that is binary (yes/no)

Comparing x/y or x:y

CALCULATE THE RATIO

Suppose 250 individuals received an HPV vaccine, 175 were females, 75 were males.

What is the ratio of females to males receiving the HPV vaccine?

CALCULATE THE RATIO

175 females: 75 males

(simply through division) 175/75: 75/75

2.33 females: 1 male

2.33 females per male

PROPORTION

Part of a whole (%),
in which the numerator
is included in the
denominator

Comparing x/(x+y)

CALCULATE THE PROPORTION

Suppose 250 individuals received an HPV vaccine, 175 were females, 75 were males.

What is the proportion of females receiving the HPV vaccine?

CALCULATE THE PROPORTION

175 females/250 in population = 0.70

Convert to percent –
0.70 x 100 = 70%

70% of the vaccinated population were female

RATE

Expression of frequency with which an event occurs in a defined population

Expressed as # per population (i.e., 100,000)

CALCULATE THE RATE

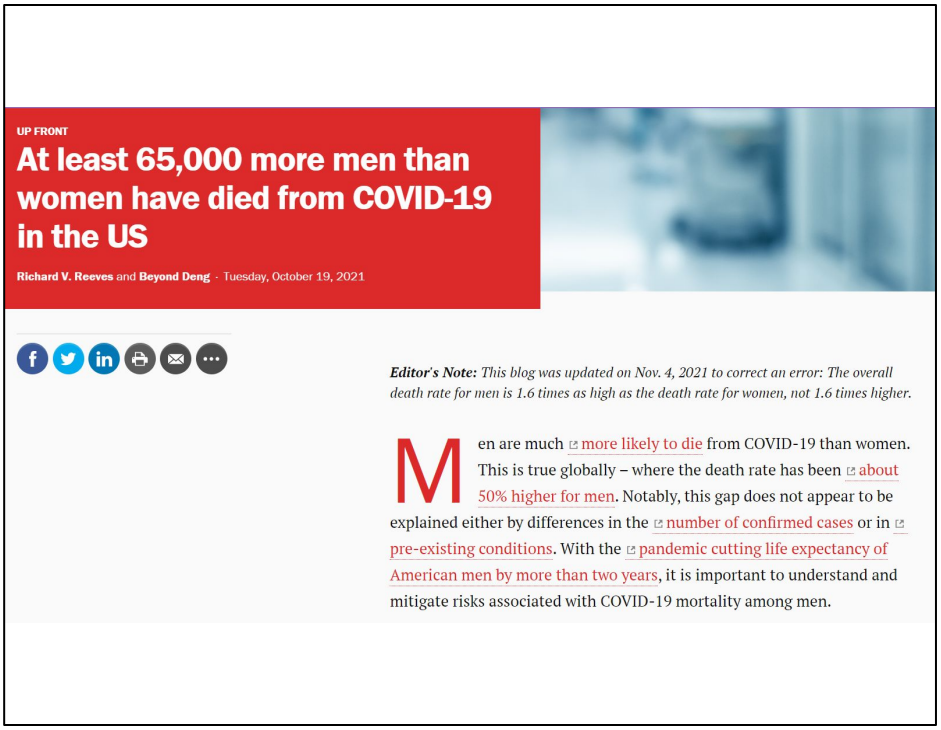
Suppose there are 1000 individuals at a health fair. 250 of those individuals received an HPV vaccine.

What is the rate (per 1000) of those receiving the HPV vaccine at the health fair?

CALCULATE THE RATE

250 per 1000 people received the HPV vaccine at the health fair

Alternatively, we can say 25 per 100 received the vaccine or 2500 per 10,000 received the vaccine.



UP FRONT

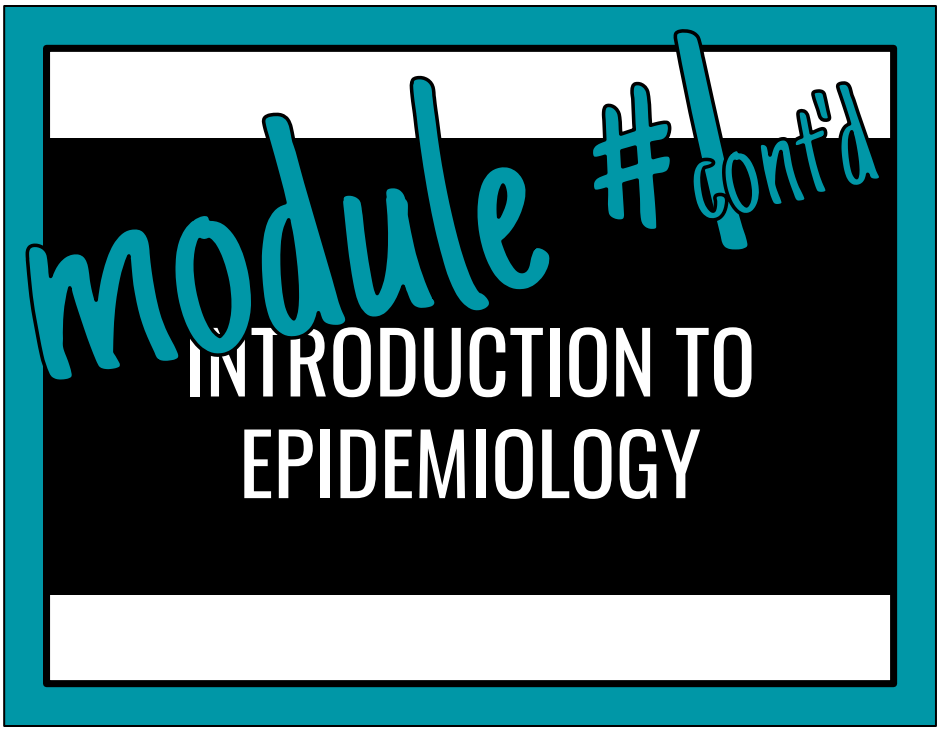
At least 65,000 more men than women have died from COVID-19 in the US

Richard V. Reeves and **Beyond Deng** · Tuesday, October 19, 2021

Editor's Note: *This blog was updated on Nov. 4, 2021 to correct an error: The overall death rate for men is 1.6 times as high as the death rate for women, not 1.6 times higher.*

Men are much more likely to die from COVID-19 than women. This is true globally – where the death rate has been about 50% higher for men. Notably, this gap does not appear to be explained either by differences in the number of confirmed cases or in pre-existing conditions. With the pandemic cutting life expectancy of American men by more than two years, it is important to understand and mitigate risks associated with COVID-19 mortality among men.

Full report from the Brookings Institute – https://www.brookings.edu/blog/up-front/2021/10/19/at-least-65000-more-men-than-women-have-died-from-covid-19-in-the-us/


module #1 cont'd
INTRODUCTION TO
EPIDEMIOLOGY

MEASURING DISEASE

1. Ratios
2. Proportions
3. Rates

More information & practice problems for rates, ratios, and proportions
https://www.khanacademy.org/test-prep/sat/x0a8c2e5f:untitled-652/x0a8c2e5f:problem-solving-and-data-analysis-lessons-by-skill/a/gtp--sat-math--article--ratios-rates-and-proportions--lesson#:~:text=A%20proportion%20is%20an%20equality,and%20solve%20for%20unknown%20quantities.&text=A%20rate%20is%20the%20quotient,the%20quantities%20have%20different%20units.

MEASURES OF DISEASE FREQUENCY

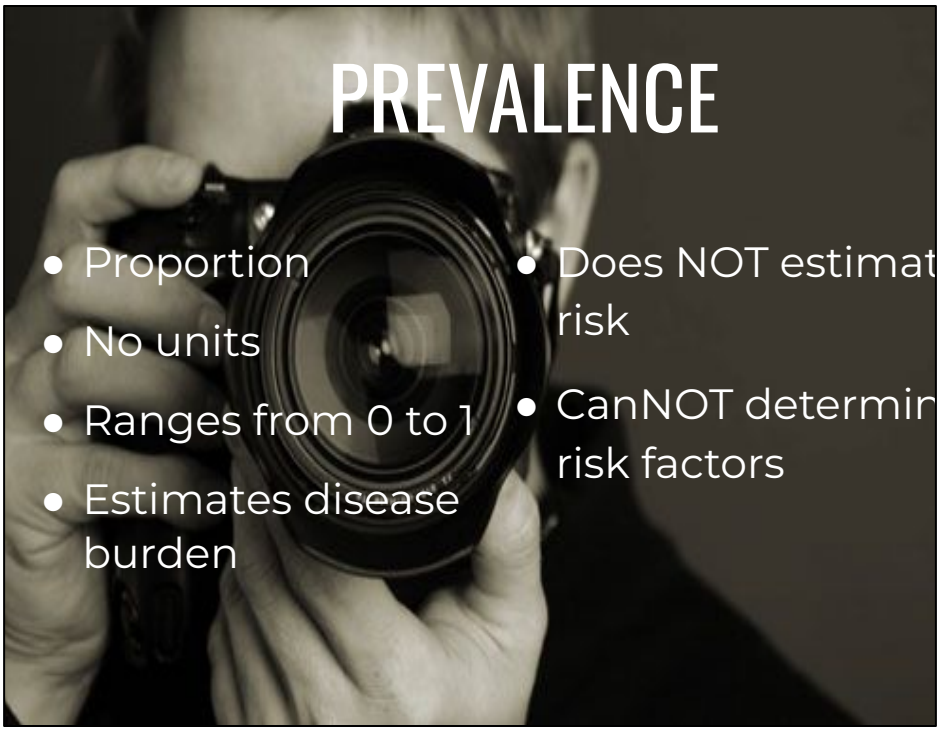
1. Prevalence
2. Incidence
3. Mortality

PREVALENCE

Total number of people with a particular disease in the population

PREVALENCE

$$\frac{\text{\# people with disease}}{\text{Total \# people in population}}$$


PREVALENCE
Proportion
No units
Ranges from 0 to 1
Estimates disease burden
Does NOT estimat risk
CanNOT determir risk factors

CALCULATE PREVALENCE

10,600 men aged 50-59 were examined in 2009 as part of a large outbreak investigation of Salmonella suspected to be in bagged spinach. 842 who were examined were found to have Salmonella.

What is the prevalence of Salmonella in this population of men?

PREVALENCE

$$\frac{842}{10{,}600}$$

PREVALENCE

=0.08

Convert to percent –
0.08 x 100 = 8%

The prevalence of Salmonella in this group of men is 8%.

Can also say that 8% of mean in this group developed Salmonella during the outbreak. CANNOT say that this 8% were diagnosed with Salmonella because of the bagged spinach. We just know that 8% of the men were sick.

INCIDENCE

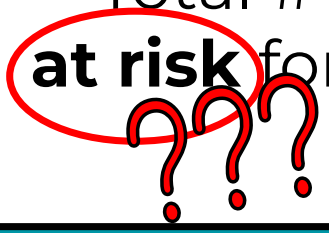
Number of **NEW** cases of disease that occur during a specific period of time in a population *at risk* for that particular disease

INCIDENCE

$$\frac{\text{\# new cases of disease}}{\text{Total \# population at risk for that disease}}$$

INCIDENCE

$$\frac{\text{\# new cases of disease}}{\text{Total \# population } \textbf{at risk} \text{ for that disease}}$$



“AT RISK” POPULATION

1. Do not have the disease
2. Able to get the disease
3. Alive

INCIDENCE

- aka *Incidence Proportion*
- Measure of RISK
- Proportion (no units)
- Range: 0 - 1

CALCULATE INCIDENCE

20,200 women aged 50-65 were examined in 2005 as part of a large study focused understanding breast cancer and exposure to deodorant. 549 were found to have breast cancer at the start of the study. During the period of 2005-2010, 579 developed breast cancer

What is the incidence of breast cancer between 2005-2010 in this population?

INCIDENCE

$$\frac{579}{20{,}200 - 549}$$

INCIDENCE

579

20,200 - 549

not at risk

had breast cancer

INCIDENCE

= 0.03

Convert to percent –
0.03 x 100

The incidence of breast cancer is 3%. Among these women the risk of breast cancer is 3%.

We cannot say that deodorant caused the breast cancer. Or that 3% of breast cancer is caused by deodorant use. What we know is that 3% of the women developed breast cancer (aka they were new cases of breast cancer) during the study period.

MORTALITY

Total number of people who have died in the population

MORTALITY

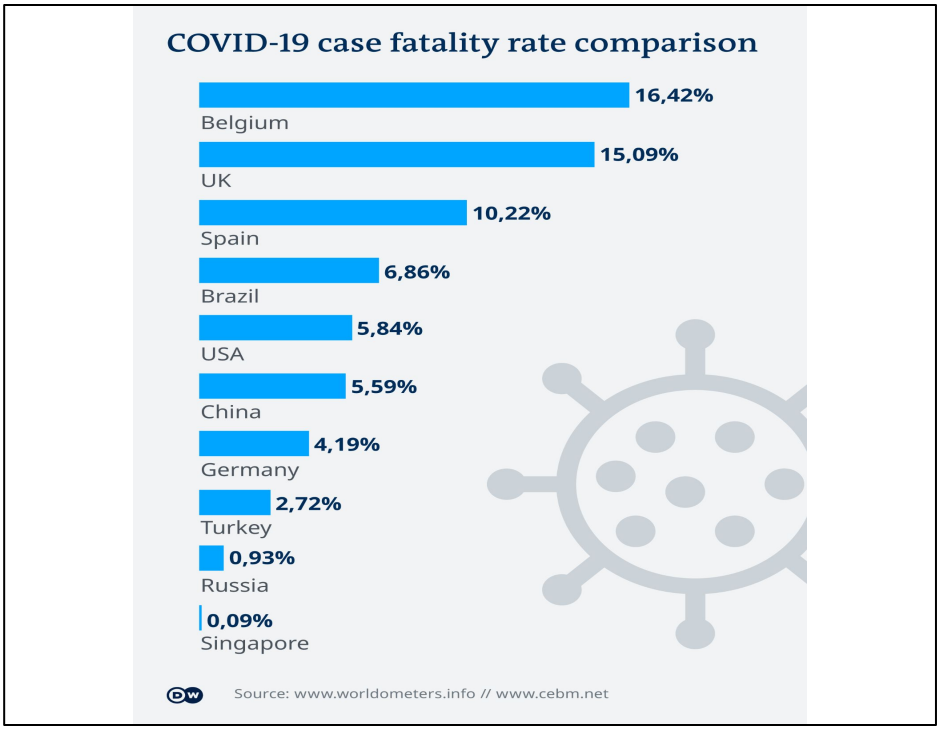
$$\frac{\text{Total \# of deaths}}{\text{Total \# people in population}}$$

CASE FATALITY

Total number of deaths from a specific disease divided by the number of individuals with that disease

CASE FATALITY

$$\frac{\text{\# deaths from a disease}}{\text{Total \# people with that disease}}$$


COVID-19 case fatality rate comparison
16,42%
Belgium
15,09%
UK
10,22%
Spain
6,86%
Brazil
5,84%
USA
5,59%
China
4,19%
Germany
2,72%
Turkey
0,93%
Russia
0,09%
Singapore
Source: www.worldometers.info // www.cebm.net

LESSON #1
Learning Outcomes

1. Define epidemiology
2. Explain the goals and key concepts of epidemiology
3. Describe how epi data has been used by public health

NEXT STEPS

1. Reading assignment
2. Review vocabulary
3. Take quiz
4. Move onto Module 2