Tutorial 1:
Health indicators

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Exercise 1: For each of the fractions shown below, indicate whether it is a:

A. Ratio
B. Proportion
C. Rate
D. None of the three.

B

$$\frac{\text{number of women in region A who died from stroke in 2010}}{\text{number of women in region A who died in 2010}}$$

C

$$\frac{\text{number of women in region A who died from stroke in 2010}}{\text{estimated number of women living in region A on July 1, 2010}}$$

A

$$\frac{\text{number of women in region A who died from stroke in 2010}}{\text{number of women in region A who died from cancer in 2010}}$$

Exercise 2: Among 13,963,753 males and 14,272,325 females, there were 20,734 cases of prostate cancer and 19,107 cases of female breast cancer. Calculate the incidence rates of prostate cancer and female breast cancer. Express your answers using an appropriate multiplier.

Prostate cancer

$$\frac{\text{Number of New cases}}{\text{Population at risk}^{1}} \times 1000$$

$$\frac{20{,}734}{13{,}963{,}753} \times 1000$$

incidence rates of prostate cancer =

1.48 per 1000 population

148 per 100000 population

Female breast cancer

$$\frac{\text{Number of New cases}}{\text{Population at risk}} \times 1000$$

$$\frac{19{,}107}{14{,}272{,}325} \times 1000$$

incidence rates of breast cancer =

1.34 per 1000 population

134 per 100000 population

(1) Since the question did not specify what is the population at risk, we **assume** that the whole population is at risk.
(2) **Units** are very important.

Exercise 3: In 2015, a total of 15,555 homicide deaths occurred among males and 4,753 homicide deaths occurred among females. The estimated 2001 midyear populations for males and females were 139,813,000 and 144,984,000 respectively.

from the information above calculate the following:

1 Homicide related death rates for males & females:

$$\frac{\text{Homicide deaths among Male\Female}}{\text{Male\Female Mid-year population}} \text{ X } 100{,}000$$

- Male = $\frac{15{,}555}{139{,}813{,}000}$ X 100,000 = 11.1 homicide deaths per 100000 population.
- Female = $\frac{4{,}753}{144{,}984{,}000}$ X 100,000 = 3.3 homicide death per 100000 population .

2 What type(s) of mortality rates did you calculate in Question 1?

- Cause & Gender specific mortality rates

3 Ratio of homicide mortality rates for males compared to females:

- Ratio = $\frac{15{,}555}{4{,}753}$ =3.3:1

" There are 3 homicide deaths among males for every female homicidal death. "

- Ratio = 11.1 / 3.3 = 3.3 to 1

4 Interpret the rate you calculated in Question 3 as if you were presenting information to a policymaker

- The calculations show that the mortality rates among males is higher than the females, So there should be specific interventions that target males and females differently.

Exercise 4: Using the data in Table 1, calculate the missing proportionate mortalities for persons aged 25-44 years for diseases of the heart and assaults (homicide).

	All ages			Ages 25–44 Years		
	Number	Percentage	Rank	Number	Percentage	Rank
All causes	2,443,930	100		128,924	100	
Diseases of heart	684,462	28	1	16,283		3
Malignant neoplasms	554,643	22.7	2	19,041	14.8	2
Cerebrovascular_disease	157,803	6.5	3	3,004	2.3	8
Chronic lower respiratory_diseases	126,128	5.2	4	401	0.3	*
Accidents (unintentional injuries)	105,695	4.3	5	27,844	21.6	1
Diabetes mellitus	73,965	3	6	2,662	2.1	9
Influenza & pneumonia	64,847	2.6	7	1,337	1	10
Alzheimer's disease	63,343	2.6	8	0	0	*
Nephritis, nephrotic syndrome, nephrosis	33,615	1.4	9	305	0.2	*
Septicemia	34,243	1.4	10	328	0.2	*
Intentional self-harm (suicide)	30,642	1.3	11	11,251	8.7	4
Chronic liver disease and cirrhosis	27,201	1.1	12	3,288	2.6	7
Assault (homicide)	17,096	0.7	13	7,367		5
HIV disease	13,544	0.5	*	6,879	5.3	6
All other	456,703	18.7		29,480	22.9	

* Not among top ranked causes

Solution :

- Proportionate mortality = $\frac{\text{deaths from Specific disease}}{\text{deaths from all causes}}$ X 100

1. heart = $\frac{16{,}283}{128{,}924}$ X 100 = 12.6%

2. Homicide = $\frac{7{,}367}{128{,}924}$ X 100 = 5.71%

Exercise 5: In 2009, 6 of 18 infected patients with H5N1 avian influenza died. What is the case fatality ratio (CFR)? What might cause this CFR to be overestimated?

1 Case fatality ratio (CFR) :

$$\text{Case fatality ratio} = \frac{\text{Total number of death of Specific disease}}{\text{Total number of cases of Specific disease}} \times 100$$

$$\text{Case fatality ratio} = \frac{6}{18} \times 100$$

$$\text{Case fatality ratio} = 33\%$$

$$\text{Case fatality ratio} = 1{:}3$$

2 What might cause this CFR to be overestimated?

- Because CFR is calculated from the KNOWN cases who presented to the hospital
- There might be A million cases that are asymptomatic! to avoid this we can do mass-screening to find out if there is a milder form of the same disease (as we saw with COVID-19)
- Another answer : active surveillance
- If the question asked for underestimation the answer would be: missed diagnose cases.

Exercise 6:

In a study concerned with the possible effects of air pollution on the development of chronic bronchitis, the following data were obtained. A population of 9,000 men aged 45 years was examined in January 2010. Of these, 6,000 lived in areas where they were exposed to air pollution and 3,000 did not. At this examination, 90 cases of chronic bronchitis were discovered, 60 among those exposed to air pollution. All the men initially examined who did not have chronic bronchitis were available for subsequent repeated examinations during the next 5 years. These examinations revealed 268 new cases of chronic bronchitis in the total group, with 30 among those unexposed to air pollution.

➔ To make it clear :

All men	At risk (exposed)	Not at risk (exposed)	All cases of chronic bronchitis	Cases among exposed	Cases among not exposed
9000	6000	3000	90	60	30
All cases after 5 years	**Cases among exposed group after 5 years**	**Cases among non-exposed group after 5 years**	**All men without chronic bronchitis after 5 years**	**Exposed men without chronic bronchitis after 5 years**	**Unexposed men without chronic bronchitis after 5 years**
268	(268-30)= 238	30	(9000-90"with chronic bronchitis")= 8910	(6000-60)=5940	(3000-30)= 2970

1 The prevalence of chronic bronchitis in January 2010:

a. 0.05%
b. 1%
c. 2%
d. 3%

$$\frac{90}{9000} \times 100 = \textbf{1 \% (B)}$$

2 The incidence rate[1] (per 1,000) of chronic bronchitis for the 5 years among those **exposed** to air pollution:

a. 39.7
b. 30.1
c. 10.0
d. 10.1
e. 40.1

$$\frac{238}{5940} \times 1000 = \textbf{40.1 Per 1000 (E)}$$

3 The incidence rate (per 1,000) of chronic bronchitis for the 5 years among those **unexposed** to air pollution:

a. 39.7
b. 30.1
c. 10.0
d. 10.1
e. 40.1

$$\frac{30}{2970} \times 1000 = \textbf{10.1 Per 1000 (D)}$$

4 The incidence rate (per 1,000) of chronic bronchitis for the 5 years in the total population:

a. 39.7
b. 30.1
c. 10.0
d. 10.1
e. 40.1

$$\frac{268}{8910} \times 1000 = \textbf{30.1 Per 1000(B)}$$

(1) For incidence always remember the denominator should be population at risk , people who are already sick they are not at risk anymore

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