Mortality Rate

Death

- Crude Death Rate
- Specific Death Rate
- Case Fatality Ratio
- Proportional Mortality ratio
- Survival Rate
- Adjusted \ Standardized Rate

International Death Certificate

- Limitations Of Death Certificate
  - Incomplete reporting
  - Lack of accuracy
  - Lack of uniformity
  - Choosing a single cause
  - Changing (code-definition-nomenclature-concepts)
  - Disease with low fatality

Specific Death Rate

Specific Death Rate

- When death rates are refined to highlight the etiological factor
  - Cause/disease specific
    - TB, Accident etc
    - Month/season etc
  - Host
    - Age, Sex, , Caste, Religion, occupation, education, etc

- Cause of death in HIV positive persons

  In India- 90% of HIV positive persons, cause of death is Tuberculosis.

  USA- Pneumonia & GI infections.

Specific Death Rate
USES

- It helps in identifying particular group/groups at risk

- Permits comparision between
  - Different causes in same population
  - Different groups in same population

Specific Death Rate Limitations

- Data – less reliable except in developed countries where satisfactory civil registration system operates
- Examples
  – Specific death rate due to tuberculosis
  – Specific death rate for males
  – Specific death rate for age-group 15-20 years
  – Monthly death rate etc

Case Fatality Rate

$$CFR = \frac{\text{Total no. of deaths due to a particular disease}}{\text{Total no. of cases due to the same disease}} \times 100$$

- CFR of Tetanus - 90%

- Malaria P.Vivax- <1%

  P. falciparum- 60%

Case Fatality Rate

- It represents the killing power of a disease
- It is typically used in acute infectious diseases & is closely related to virulence

Case Fatality Rate Limitations

- Time interval – not specified
- Chronic diseases – onset$\rightarrow$ death = long and variable period

Proportional Mortality Rate

Example:

$$\frac{\text{No. of deaths from a specific disease in a year}}{\text{Total no of deaths (from all causes in that year)}} \times 100$$

Proportional Mortality Rate

- To know the relative importance of
  - Specific cause/disease
  - Specific age & sex group

- Especially when population data is not available, so, it does not indicate risk.

Proportional mortality rate is dependent on two data

1. Total deaths
2. Deaths due to disease/ in particular groups

- Both are variable (dependent), so, less reliable

- Cause of death varies according to age, sex etc, so may indicate preventable mortality

Special Death Rate

- Denominator is different
- Not population or death but event, e.g.
  - Infant Mortality Rate (IMR)

    (No. of infant deaths in a year/ no. of live births in the year) x 1000

  - Maternal Mortality Rate (MMR)
  - Perinatal Mortality Rate

Survival Rate

- Describes proportion of survivors in a group at the end of a particular time period (esp. used in cancers)
- For describing prognosis in a quantitative term
- Yardstick for the assessment of standards of therapy/treatment
- Survival Rate = (total no. of patients alive after 5 yrs / total no. of patients) x 100.

Adjusted
Or
Standardized
Rate

- CDR of village A- 12

- CDR of village B- 9

Village- A
- CDR -12

Age	Population
0-10	12,000
11-20	15,000
21-40	40,000
41-50	10,000
51-60	60,000

Village- B
- CDR-9

Age	Population
0-10	12,000
11-20	15,000
21-40	40,000
41-50	10,000
51-60	60,000

Village- A
- CDR -12

Age	Population
0-10	12,000
11-20	15,000
21-40	40,000
41-50	10,000
51-60	60,000

Village- B
- CDR-9

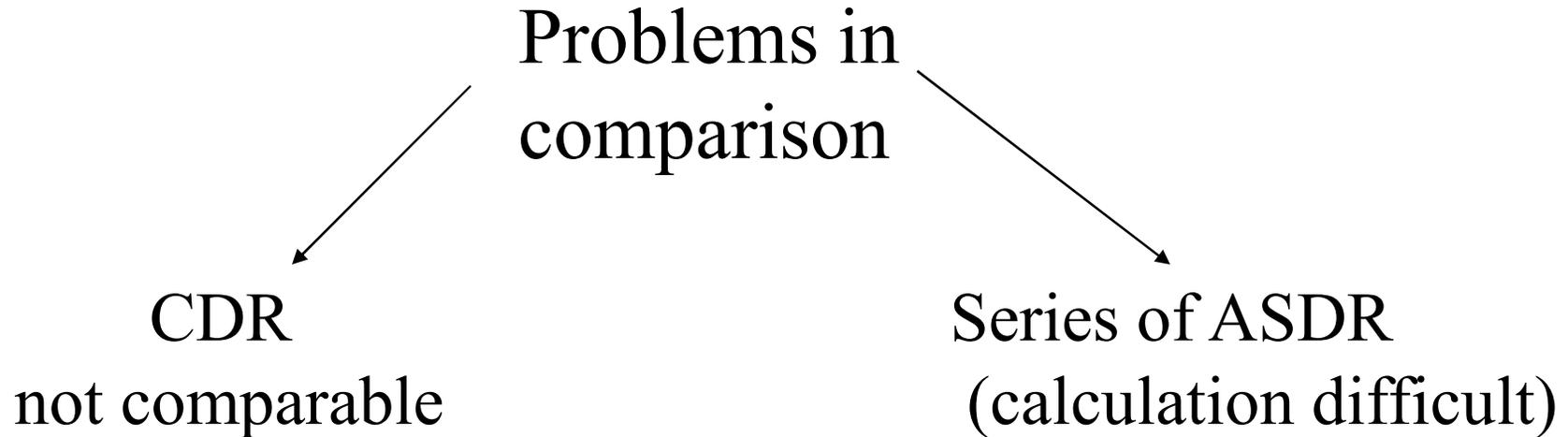| Age	Population
0-10	5,000
11-20	12,000
21-40	60,000
41-50	40,000
51-60	10,000

Standardized Rates

Rates are only comparable if the population upon which they are based are comparable
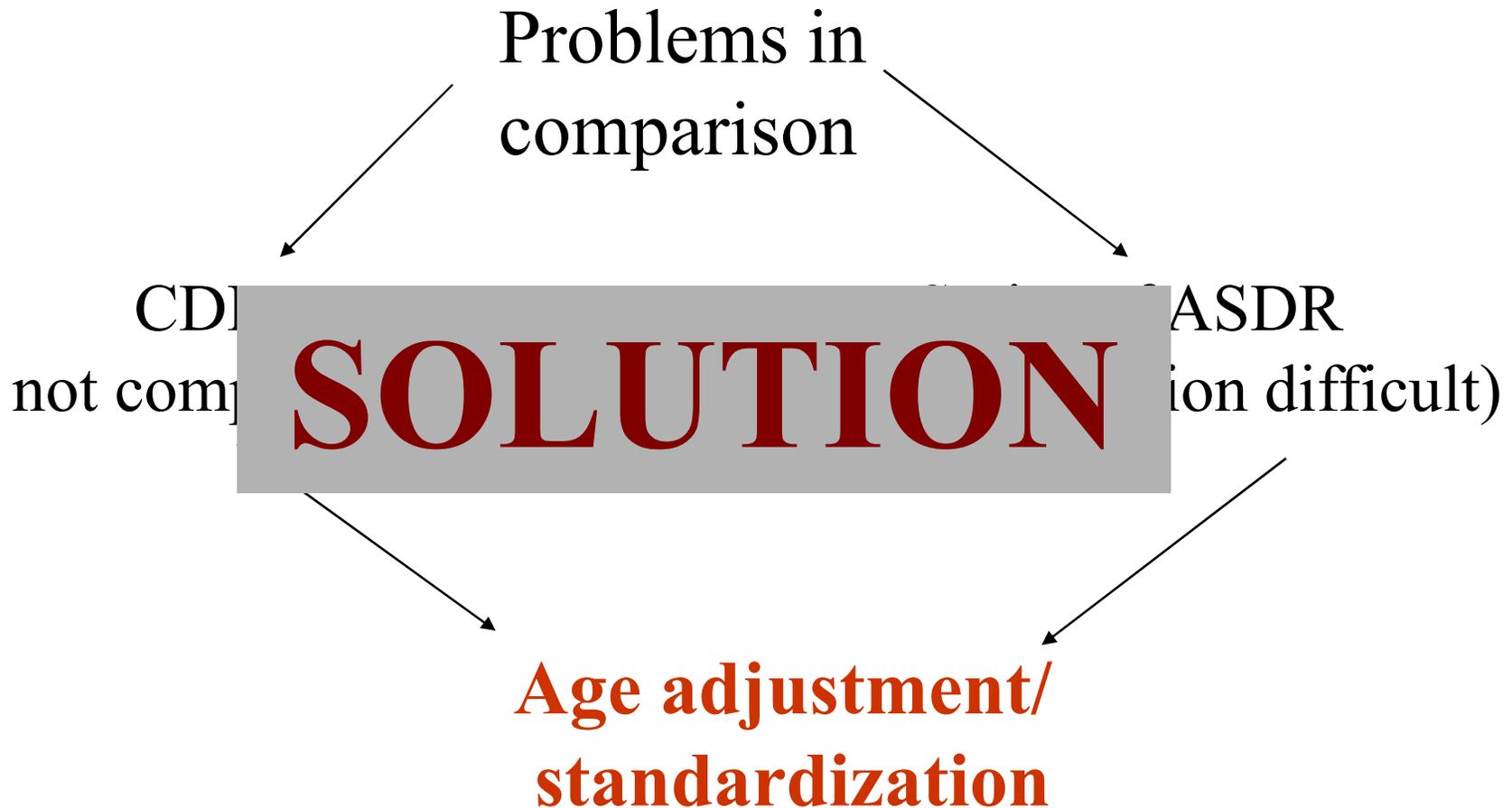
Problems in
comparison

CDR
not comparable

Series of ASDR
(calculation difficult)

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SOLUTION

ASDR
ion difficult)
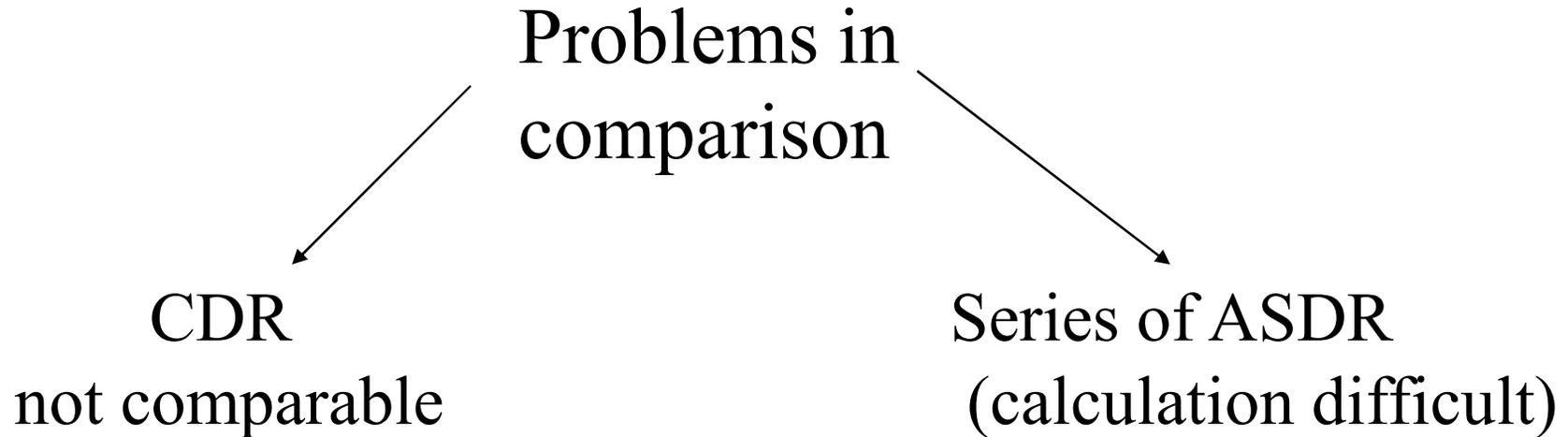
Age adjustment/ standardization

Age adjustment / standardization

- It removes the confounding effect of different age structure and yields a single standard / adjusted rate.

Standardization techniques:

    Absolute age adjustment rate

    Life table

    Regression

    Multivariate analysis

Standard population

- A standard population is defined as one for which the numbers in each age & sex group are known

Standardization

– Direct
– Indirect

CDR of a village -   9.87

CDR of Taluka – 9.9

Direct Standardization

CDR of a village -   9.87

When age & sex wise structure of study population is known			
Age	MYP	Death	ASDR (1000)
0-14	22000	22	**1.00**
15-44	44000	46	**1.05**
45-65	14000	722	**51.57**
Total	80000	790	**9.87**

Direct Standardization

When age & sex wise structure of study population is known			
Age	MYP	Death	ASDR (1000)
0-14	22000	22	**1.00**
15-44	44000	46	**1.05**
45-65	14000	722	**51.57**
	80000	790	9.87
Standard population			
Age	MYP	Death	ASDR (1000)
0-14	3,10,000	**1.00**	
15-44	4,30,000	**1.05**	
45-65	1,90,000	**51.57**	
	9,30,000		

Direct Standardization

When age & sex wise structure of study population is known			
Age	MYP	Death	ASDR (1000)
0-14	22000	22	**1.00**
15-44	44000	46	**1.05**
45-65	14000	722	**51.57**
	80000	790	**9.87**
Standard population			
Age	MYP	Death	ASDR (1000)
0-14	3,10,000	**1.00**	310
15-44	4,30,000	**1.05**	452
45-65	1,90,000	**51.57**	9798
	9,30,000	**11.35**	10560

Direct standardization

Study population

↓

ASDR

↓

Apply to standard population

↓

Expected deaths

↓

Standardised death rate

Indirect Standardization

- When age & sex wise structure of population is not known but ASDR of standard population is available

(Usually standard population – National Census)

Indirect Standardization

- Instead of a standard population, a set of age specific standard rate is selected
- Although less preferable, it is more commonly used

Indirect Standardization

Age	Coal worker MYP	Observed Death
25-34	300	
35-44	400	
45-54	200	
55-64	100	
	1000	**9**

Indirect Standardization

Age	National pop. Death Rate
25-34	3.0
35-44	5.0
45-54	8.0
55-64	25.0

Indirect Standardization

Age	National pop. Death Rate	Coal worker MYP	Expected Death
25-34	3.0	300	0.9
35-44	5.0	400	2.0
45-54	8.0	200	1.6
55-64	25.0	100	2.5
		1000	**7.0**

Indirect Standardization

Age	National pop. Death Rate	Coal worker MYP	Expected Death	Observed Death
25-34	3.0	300	0.9	
35-44	5.0	400	2.0	
45-54	8.0	200	1.6	
55-64	25.0	100	2.5	
		1000	**7.0**	**9.0**

Standardized Mortality Ratio (SMR)

SMR

= (Obs death / Exp. Death) x 100

= (9/7) x 100

= 129

(29% Excess mortality than expected)

- Two indirectly standardised rates strictly cannot be compared even if same standard set of rates is used because of different in age-sex distribution of the population, whose rates are being standardized.

- The Only valid comparision of an indirectly standardised rate is the population from which standardized rates were derived.

Visual comparision of Direct & Indirect Standardization

Direct

Standard
Population

Study
Population-1

Standardized
Death Rate-1

ASDR-1

Direct Standardization

Study
Pop. 1

Standard
Population

Study
Pop. 2

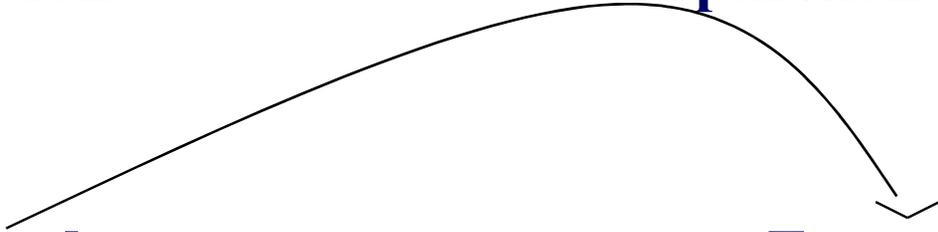ASDR 1

Standardized
Death Rate

ASDR 2

1

2
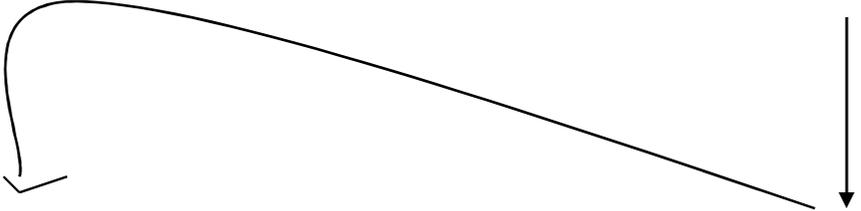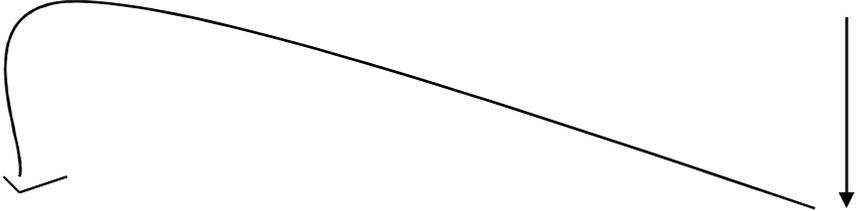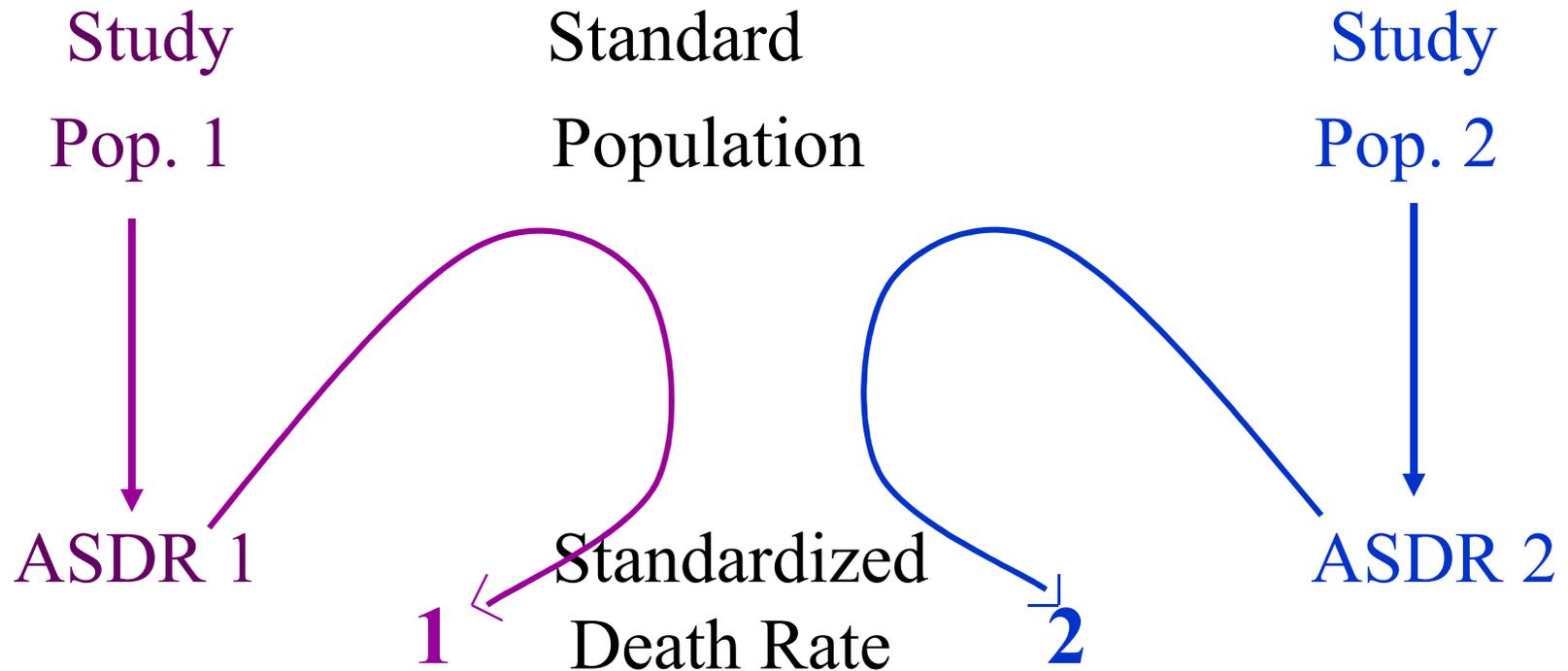
Comparable

Indirect

Standard
Population

Study -1
Population

Standard
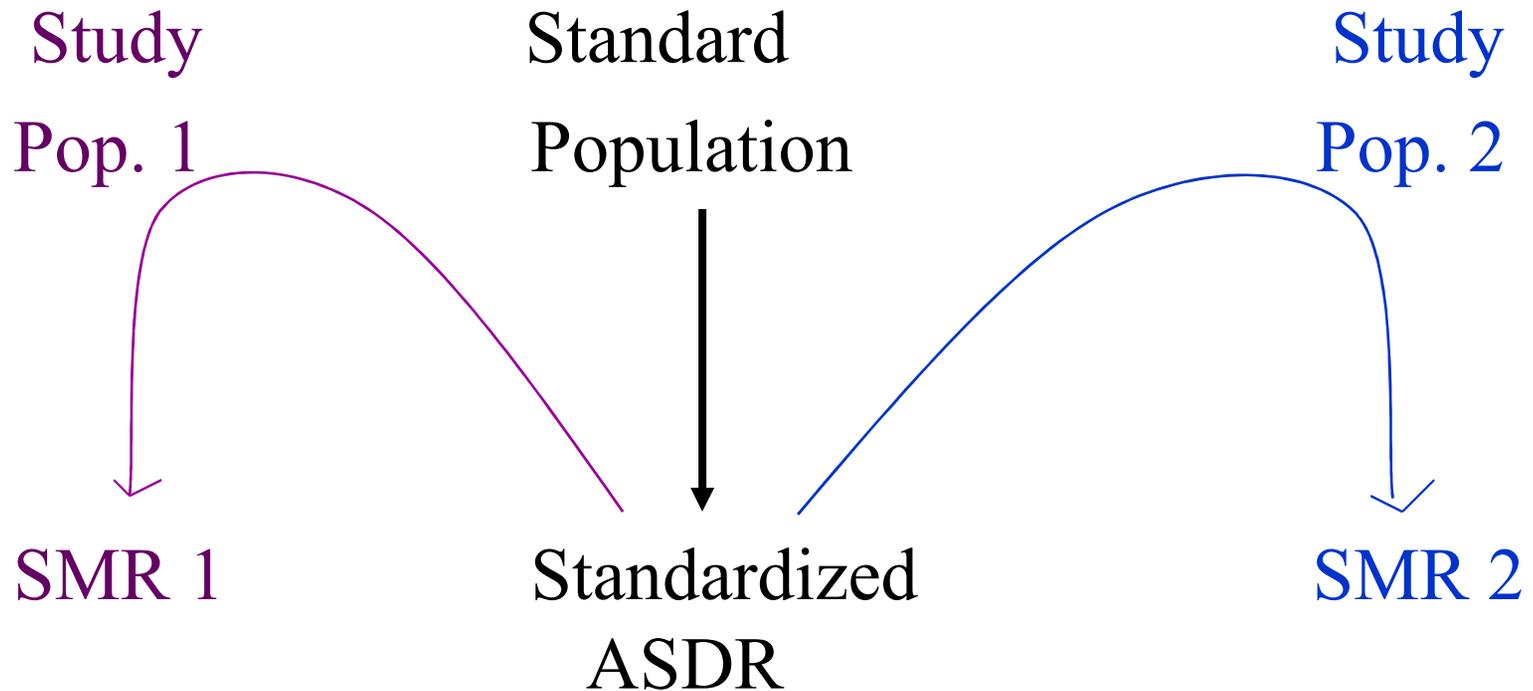
ASDR

Expected

Death

Indirect

Standard
Population

Study
Population-1

Standard
ASDR

Expected Death
SMR-1

THANK YOU