Standardization

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Example : Dengue hemorrhagic fever (DHF)

Province A : reported DHF 300 cases

Province B : reported DHF 100 cases

Which province has more DHF cases?

Which province has more problem with DHF?

Example : Dengue hemorrhagic fever (DHF)

	number of case	population
Province A	300	200,000
Province B	100	100,000

Incidence in province A = 300 / 200,000 = 150 per 100,000 pop.

Incidence in province B = 100 / 100,000 = 100 per 100,000 pop.

Which province has more problem with DHF?

Example : Dengue hemorrhagic fever (DHF)

Province A	Cases	Population
< 1	0	2,000
1 – 4	180	45,000
5 – 14	80	40,000
15 – 24	30	30,000
25 – 34	10	20,000
35 – 44	0	20,000
45 – 54	0	18,000
55 – 64	0	15,000
> 65	0	10,000
Total	300	200,000

Province B	Cases	Population
< 1	0	1,000
1 – 4	30	5,000
5 – 14	30	10,000
15 – 24	20	10,000
25 – 34	20	20,000
35 – 44	0	22,000
45 – 54	0	15,000
55 – 64	0	12,000
> 65	0	5,000
Total	100	100,000

Example : Dengue hemorrhagic fever (DHF)

Province A	Population	Incidence (/100000)
< 1	2,000	0
1 – 4	45,000	400
5 – 14	40,000	200
15 – 24	30,000	100
25 – 34	20,000	50
35 – 44	20,000	0
45 – 54	18,000	0
55 – 64	15,000	0
> 65	10,000	0
Total	200,000	150

Province B	Population	Incidence (/100000)
< 1	1,000	0
1 – 4	5,000	600
5 – 14	10,000	300
15 – 24	10,000	200
25 – 34	20,000	100
35 – 44	22,000	0
45 – 54	15,000	0
55 – 64	12,000	0
> 65	5,000	0
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Example : Dengue hemorrhagic fever (DHF)

Province A	Population	Percentage
< 1	2,000	1
1 – 4	45,000	23
5 – 14	40,000	20
15 – 24	30,000	15
25 – 34	20,000	10
35 – 44	20,000	10
45 – 54	18,000	9
55 – 64	15,000	8
> 65	10,000	5
Total	200,000	100

Province B	Population	Percentage
< 1	1,000	1
1 – 4	5,000	5
5 – 14	10,000	10
15 – 24	10,000	10
25 – 34	20,000	20
35 – 44	22,000	22
45 – 54	15,000	15
55 – 64	12,000	12
> 65	5,000	5
Total	100,000	100

Confounder effect

- The comparison of crude rate is confounded by the differences between two populations (age distribution)

  Age is confounder

- Province A has a younger age distribution
- An adjustment method is needed to make an appropriate comparison of the overall risk of illness between the two populations

Appropriate comparison

- Standardized rates allows comparison of summary event rates between populations when there are differences in characteristics between the populations that may influence the event of interest

  age, race, disease status

- Methods

  Direct standardization

  Indirect standardization

Direct standardization

- Apply stratum-specific rates observed in the target population to a standard population in order to obtain the number of cases expected in the standard population
- Calculate an adjusted rate based on expected number of cases in the standard population
  - Use the stratum-specific rates of the target population to calculate the number of cases expected in the standard population
  - The expected number of cases divided by the standard population
- What would the rate in the standard population be if it had the same age structure?

Direct standardization

Age group	Total Pop	Incidence (/100000)		Expected cases	
	(Standard)	Province A	Province B	Province A	Province B
< 1	3,000	0	0	0	0
1 – 4	50,000	400	600	200	300
5 – 14	50,000	200	300	100	150
15 – 24	40,000	100	200	40	80
25 – 34	40,000	50	100	20	40
35 – 44	42,000	0	0	0	0
45 – 54	33,000	0	0	0	0
55 – 64	27,000	0	0	0	0
> 65	15,000	0	0	0	0
Total	300,000	150	100	360	570

Example : DHF (crude rate)

	number of case	population
Province A	300	200,000
Province B	100	100,000

Incidence in province A = 300 / 200,000 = 150 per 100,000 pop.

Incidence in province B = 100 / 100,000 = 100 per 100,000 pop.

Which province has more problem with DHF?

Example : DHF (standardized rate)

	number of case	population
Province A	360	300,000
Province B	570	300,000

Incidence in province A = 360 / 300,000 = 120 per 100,000 pop.

Incidence in province B = 570 / 300,000 = 190 per 100,000 pop.

Which province has more problem with DHF?

Direct standardisation

- Direct standardisation applies age-specific rates from the target population to the age group structure of a standard population.
- What do you do if you

  cannot get number of case by age group for the target population

  cannot get age-specific rates for the target population or if these rates are unstable (e.g. because of low numbers in some age groups)?

Indirect standardisation

- Indirect standardisation applies age-specific rates from the standard population to the age group structure of the target population.
- Then constructs ratio of observed to expected population cases

  Indirectly standardised rates are usually presented as Standardised Mortality Ratio (SMR)

  SMR = observed cases / expected cases
- How does the observed case compare with the expected case?

Example : Dengue hemorrhagic fever (DHF)

Age group	Country incidence	Province A			Province B		
	/100000	Cases	Population	Expected cases	Cases	Population	Expected cases
< 1	0		2000	0		1000	0
1 – 4	200		45000	90		5000	10
5 – 14	160		40000	64		10000	16
15 – 24	100		30000	30		10000	10
25 – 34	50		20000	10		20000	10
35 – 44	0		20000	0		22000	0
45 – 54	0		18000	0		15000	0
55 –							

SMR Province A = 300 / 194 = 1.55

SMR Province B = 100 / 46 = 2.17

Thank you