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Health Statistics and Vital Statistics

Community Health Nursing

Sources of health data, vital statistics, morbidity and mortality indicators, fertility indicators, rates and ratios, data collection, presentation, interpretation and uses in public health.

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CHAPTER 23 / COMMUNITY HEALTH NURSING 23. Health Statistics and Vital Statistics

1. Definition and sources

Health statistics are numerical data describing health, disease, healthcare services and determinants. Vital statistics describe vital events such as births and deaths. Sources include civil registration (CRS), Sample Registration System (SRS), census, NFHS, HMIS, disease surveillance, facility registers and community surveys. Each source has a defined population, period and purpose.

2. Basic statistical concepts

A count is the absolute number of events. A ratio compares two quantities; a proportion has a numerator included within its denominator; a rate usually relates events to population and time. Specify denominator, multiplier and period. Mean = sum of values / number of values; median = middle value after sorting; mode = most frequent value. Range = maximum minus minimum. Standard deviation measures spread around the mean.

3. Morbidity indicators

Indicator	Formula
Incidence proportion	New cases / people initially at risk x multiplier
Incidence rate	New cases / person-time at risk
Point prevalence	Existing cases at a specified instant / population at that instant x multiplier
Attack proportion	New outbreak cases / exposed persons at risk x 100
Case fatality proportion	Deaths due to disease / cases of disease x 100

4. Mortality and fertility indicators

Indicator	Formula and unit
Crude birth rate (CBR)	Live births / midyear population x 1,000
Crude death rate (CDR)	Deaths / midyear population x 1,000
Infant mortality rate (IMR)	Deaths before first birthday / live births x 1,000
Neonatal mortality rate (NMR)	Deaths during first 28 completed days / live births x 1,000
Under-five mortality rate	Probability of dying before fifth birthday per 1,000 live births; estimated using life-table methods

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Maternal mortality ratio (MMR)	Maternal deaths / live births x 100,000
General fertility rate	Live births / women aged 15-49 x 1,000
Total fertility rate	Sum of age-specific fertility rates x age-band width, adjusted to births per woman

A maternal death is death during pregnancy or within 42 days after its termination due to a cause related to or aggravated by pregnancy or management, excluding accidental/incidental causes. Use corresponding time periods and official definitions.

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5. Worked examples (illustrative)

A district records 2,000 live births, 40 infant deaths and 4 maternal deaths in one year. IMR = 40 / 2,000 x 1,000 = 20 per 1,000 live births. MMR = 4 / 2,000 x 100,000 = 200 per 100,000 live births. Small numerators produce unstable rates; avoid ranking areas without considering population size and uncertainty.

A survey identifies 60 existing cases among 600 adults. Prevalence = 10%. If 180 of 200 eligible children received a specified dose, dose coverage = 90%. Numerators must refer to unique eligible children, not total injections.

6. Data collection and presentation

Define variables, use standardized forms, train collectors, obtain consent as required, validate entries and protect confidentiality. Present categorical data in tables or bar charts, trends with line graphs, continuous grouped distributions with histograms, and geographic patterns with appropriately aggregated maps. Always label units, dates and sources. Avoid misleading axes, incompatible denominators and double counting.

7. Interpretation and public health use

Statistics guide needs assessment, resource allocation, programme monitoring, outbreak detection, research and evaluation. Compare like populations and periods; crude rates can differ because of age structure; age-standardized rates may be appropriate for fair comparison. Missing data, selection bias and under-registration can distort conclusions.

8. Nursing importance

Collect and validate counts, maintain confidentiality, calculate correct rates, review trends, assess service gaps, report abnormalities and use findings for local planning.

9. Distinguishing rates, ratios and proportions

A proportion has a numerator that is part of its denominator, such as documented immunisation coverage. A ratio compares two quantities, which need not be part of one another. Rates describe event occurrence relative to a population and time basis; some public health measures conventionally called rates are actually ratios or proportions.

Measure	Denominator
Crude birth rate	Mid-year total population.

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Infant mortality rate	Live births in the relevant period, conventionally per 1,000.
Maternal mortality ratio	Live births, conventionally per 100,000.
Incidence rate	Person-time at risk.
Prevalence	Population assessed at a defined point or period.

10. Worked statistical examples

A fictional district recorded 2,000 live births, 36 infant deaths and two maternal deaths in a calendar year. IMR = 36/2,000 x 1,000 = 18 per 1,000 live births. MMR = 2/2,000 x 100,000 = 100 per 100,000 live births. Small annual event counts can make these measures unstable; compare trends carefully and use official definitions to identify qualifying deaths.

A screening camp has results for 180 of 200 eligible people. Coverage is 180/200 x 100 = 90%. If 18 of those screened are positive, screen positivity is 18/180 x 100 = 10%, not 10% confirmed disease prevalence.

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Data presentation

Use a bar chart for category comparisons, a line chart for trends, a histogram for continuous grouped measurements and a table for exact values. Include title, time period, units and source. Keep missing data separate from zero values.

11. Important Examination Questions

Long Answer Questions

1. 1. Define vital statistics and explain major morbidity/mortality/fertility indicators with examples.
2. 2. Explain and calculate selected morbidity and mortality indicators from given data.
3. 3. Discuss presentation and interpretation of community health statistics.

Short Answer Questions

1. 1. Mean/median/mode
2. 2. incidence vs prevalence
3. 3. MMR vs IMR
4. 4. sources of data
5. 5. Ratio versus proportion.
6. 6. Screen positivity versus prevalence.
7. 7. Graph selection.
8. 8. Data quality checks.

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Very Short Answer Questions (with answers)

1. 1. MMR multiplier? 100,000 live births.
2. 2. IMR multiplier? 1,000 live births.
3. 3. Most frequent value? Mode.
4. 4. What is the MMR denominator? - Live births.
5. 5. What is the incidence-rate denominator? - Person-time at risk.

12. Quick Revision

- Always state numerator, denominator, multiplier and period.
- Do not confuse screening positivity with confirmed prevalence.
- Compare populations using appropriate standardized measures.
- Missing data are not zeros.

Conclusion

Accurate statistics provide the foundation for accountable public health decisions.

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Practice questions

Choose one best answer. The answer key and explanations follow the questions.

1. Which statistic is the middle value after observations are sorted?

A. Mode
B. Range
C. Median
D. Mean

2. What denominator is used for the maternal mortality ratio?

A. All pregnancies
B. Women aged 15-49
C. Total midyear population
D. Live births

3. A district has 40 infant deaths and 2,000 live births in one year. What is its infant mortality rate?

A. 20 per 1,000 live births
B. 2 per 1,000 live births
C. 40 per 1,000 live births
D. 200 per 1,000 live births

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Answer key and explanations

1. C - Median

The median is the middle sorted value, while the mean is the arithmetic average.

2. D - Live births

The maternal mortality ratio is maternal deaths per 100,000 live births.

3. A - 20 per 1,000 live births

The calculation is 40/2,000 x 1,000 = 20.

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