Epidemiology and clinical evidence

Supported GRE teaching and original transfer practice

Epidemiology and clinical evidence

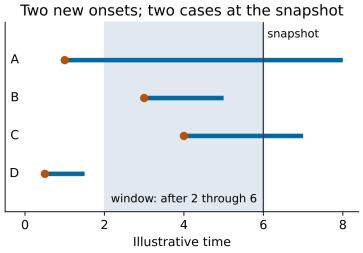
- Separate **incidence 发病率** from **prevalence 患病率**, with the right denominators.
- Compare study designs: case–control, **cohort study 队列研究**, randomised trial and meta-analysis.
- Read relative and absolute risk, and the number needed to treat.
- Use base rates to read screening results.

Incidence and prevalence

- Incidence counts new cases in a period. Cumulative incidence divides by the number of people at risk at the start; an incidence rate divides by person-time at risk.
- Prevalence counts all existing cases at one time, divided by the population then.
- Long-lasting conditions can have low incidence and high prevalence. A short outbreak can have high incidence and low prevalence.
- Compare rates, not raw counts, when populations differ in size.

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Figure: Incidence and prevalence



Selected case histories only. Dots = onset; line ends = no longer a case.

- Incidence counts new onsets in the window (two); prevalence counts cases at the snapshot (two)
- Match each part of the diagram to the text.

Study designs

- Case report: describes one or a few patients. It suggests ideas but tests nothing.
- **Case–control study 病例对照研究**: starts from people with and without the disease and looks back at exposures. It suits rare diseases.
- **Cohort study**: follows exposed and unexposed people forward and counts new cases.

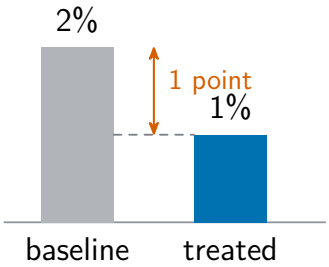
Study designs (2)

- Randomised controlled trial: chance decides who is treated, which balances confounders, known and unknown, on average.
- Meta-analysis: combines studies. It cannot repair weak studies, and missing negative results bias it.
- The design is a guide, not a guarantee: a badly run trial can mislead more than a careful **cohort study**.

Risk

- Relative risk reduction compares the treated risk with the baseline: 2% to 1% is a 50% reduction.
- Absolute risk reduction is the difference: 2% to 1% is 1 percentage point.
- The **number needed to treat 需治疗人数** is 1 divided by the absolute reduction: here 100.
- A relative figure means little without the baseline risk and the follow-up time.

Figure: Risk



relative: half the risk, a 50% reduction
absolute: 1 percentage point

- Relative and absolute reductions tell different stories.
- Match each part of the diagram to the text.

Screening and base rates

- Sensitivity: the share of real cases the test detects.
- Specificity: the share of non-cases the test correctly clears.
- The share of positives who really have the condition depends strongly on prevalence.

Worked example: rates

- Cumulative incidence: $12/600 = 0.02$, 2% over one year.
- Point prevalence: $30/750 = 0.04$, 4%, counting old and new cases.
- A trial with risks of 4% (control) and 3% (treatment): relative reduction 25%, absolute reduction 1 point, number needed to treat 100.

Worked example: a screening test

- 100 people have the condition; the test finds 90.
- 9,900 do not; 5% of them, 495, test positive anyway.
- Of 585 positives, only $90/585 = 15\%$ have the condition.

Common errors

- Reporting a count of new cases as prevalence.
- Mixing person-time and people-at-risk denominators.
- Quoting a relative risk without the baseline.

Common errors (2)

- Treating a meta-analysis as automatically strong.
- Reading a positive screening result as near-certain for a rare condition.

Key terms

- **incidence**: The number or rate of new cases in a stated period.
- **prevalence**: The proportion of a population with a condition at a given time.
- **cohort study**: A study that follows exposed and unexposed groups forward in time.
- **case–control study**: A study that compares people with and without a disease and looks back at their exposures.

Check yourself

- A survey counts everyone currently diagnosed with depression in a city. Incidence or prevalence?
- A drug lowers risk from 10% to 5%. What is the number needed to treat?
- Which design suits a very rare disease best: cohort or case–control?