

Exercise walk-through

12.2

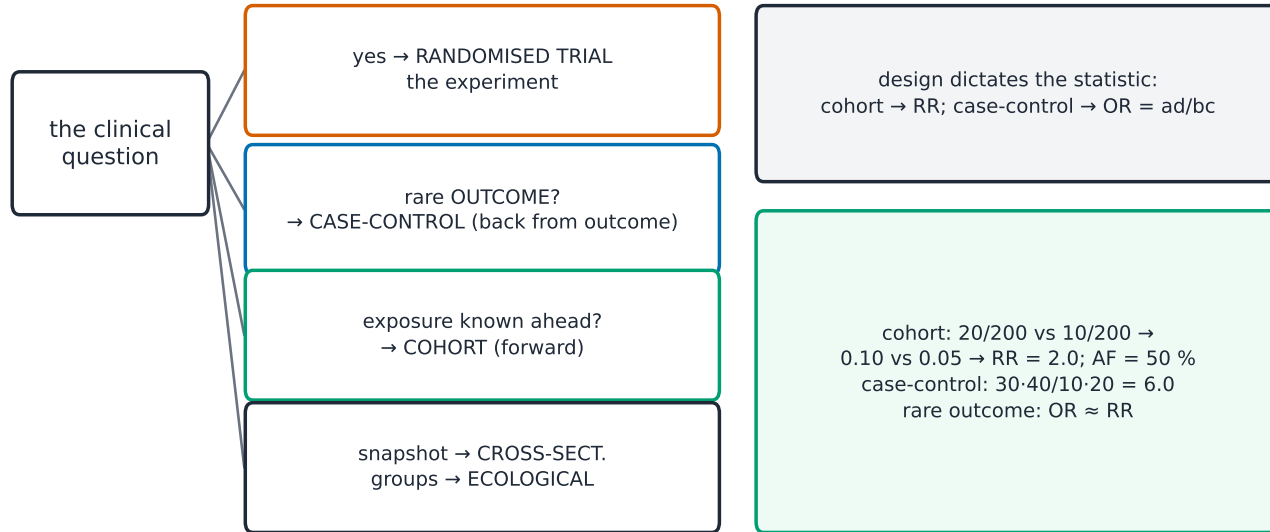
Study designs

University Medicine

Study designs: the ladder and the statistic

- 1 **Ladder** Trial $\rightarrow$ cohort (by exposure, RR) $\rightarrow$ case-control (by outcome, OR = ad/bc) $\rightarrow$ cross-sectional $\rightarrow$ ecological.
- 2 **Worked** Cohort 20/200 vs 10/200 $\rightarrow$ 0.10/0.05 $\rightarrow$ RR 2.0, AF 50 %;
case-control 30 · 40/10 · 20 = OR 6.0.
- 3 **Why** Sampling by outcome makes arm risks artefacts; rare-disease OR $\approx$ RR.

The design decision tree



Rare outcome → case-control; exposure ahead → cohort; both at once → trial.

Exercises 2.1-2.3

2.1 Which design licenses the relative risk? [3]

2.2 Exposed 30/300, unexposed 15/300 – RR? [3]

2.3 Cases: 40 exposed, 10 not; controls: 20 and 30 – OR? [3]

Exercises 2.1-2.3

2.1 Which design licenses the relative risk? [3]

2.1

- The cohort (samples by exposure; risks estimable) ✓.

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2.2

- $0.10/0.05 = \text{RR } 2.0$ ✓.

2.3 Cases: 40 exposed, 10 not; controls: 20 and 30 – OR? [3]

2.3

- $\text{OR} = (40 \times 30)/(10 \times 20) = 6.0$ ✓.

Exercise 3.1

3.1 A synthetic cohort: 400 exposed (36 events) and 400 unexposed (12 events).

Compute both risks (9 % vs 3 %), the RR (3.0) and the attributable fraction among the exposed $((RR-1)/RR = 67 \%)$ ✓. Explain what the attributable fraction claims and what it assumes (causal exposure; no confounding) ✓. [8]

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3.1 A synthetic cohort: 400 exposed (36 events) and 400 unexposed (12 events).

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3.1

- Risks: $36/400 = 9\%$; $12/400 = 3\%$ ✓.
- $RR = 9/3 = 3.0$ ✓.
- Attributable fraction = $(3-1)/3 = 67\%$ of exposed events ✓.
- Claims: the share of exposed cases owing to exposure – assuming the exposure is causal and unconfounded ✓.

Exercise 3.2

3.2 A synthetic case-control of a rare outcome: among 50 cases, 30 exposed; among 50 controls, 10 exposed.

Compute the OR ($30 \times 40 / 20 \times 10 = 6.0$) ✓. Explain why RR cannot be computed (sampling by outcome fixes the 50/50 split) and why $OR \approx RR$ here (rare outcome: $(a+b)/b \approx b/b$) ✓.

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3.2

- $OR = ad/bc = (30 \times 40)/(20 \times 10) = 6.0$ ✓.
- RR illegal: the 50/50 case-control split is the researcher's choice, not the population's risks ✓.
- Rare outcome $\rightarrow$ odds $\approx$ risks within groups $\rightarrow OR \approx RR$ ✓.