

Exercise walk-through

12.5

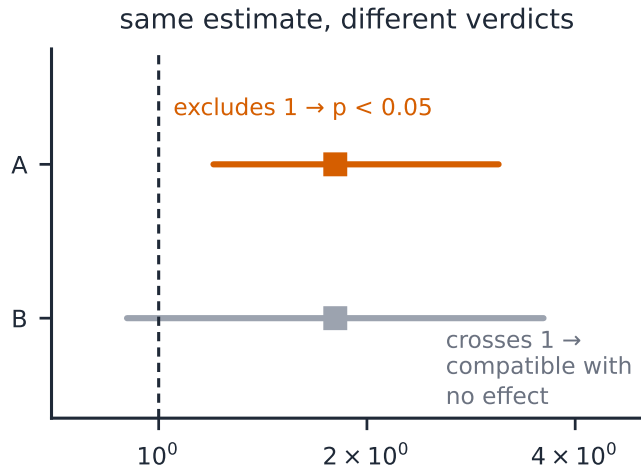
Statistical inference for clinical data

University Medicine

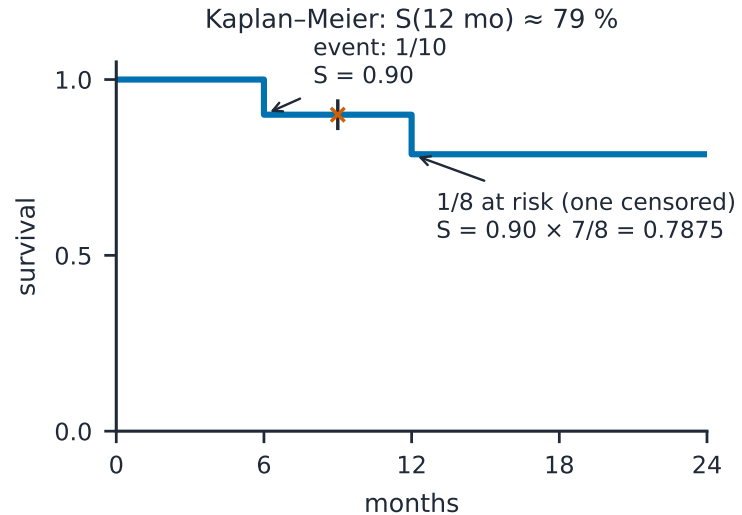
Statistical inference for clinical data: intervals and steps

- 1 **Interval** RR 1.8 (1.2–3.1) excludes 1; RR 1.8 (0.9–3.6) is compatible with no effect - same estimate, different verdicts.
- 2 **Tests** Counts χ^2 · two means t (paired if twice-measured) · several means ANOVA · skewed rank · correlation.
- 3 **Survival Kaplan–Meier** multiplies $(1 - \text{events/at-risk})$: $S = 0.90$ then $0.90 \times 7/8 = 0.7875$; median = the 50 % crossing.

CI forest and Kaplan–Meier plots



p-value: $P(\text{data this extreme} \mid \text{null})$ — surprise, not size · CI carries both · tests: χ^2 · t · ANOVA · rank · correlation



The interval carries size and precision; the survival curve steps down at events.

Exercises 2.1-2.3

2.1 Interpret “95 % CI 1.1–2.0” for an RR in one sentence.

[3]

2.2 Which test compares two group proportions?

[3]

2.3 Why can a Kaplan–Meier curve stay flat?

[3]

Exercises 2.1-2.3

2.1 Interpret “95 % CI 1.1–2.0” for an RR in one sentence. [3]

2.1

- The range of true RRs compatible with the data at this level – excluding 1, the effect stands ✓.

2.2 Which test compares two group proportions? [3]

2.2

- The χ^2 test ✓.

2.3 Why can a Kaplan–Meier curve stay flat? [3]

2.3

- No events in that interval – only events move the curve ✓.

Exercise 3.1

3.1 Two fictional abstracts: study A RR 1.6 (95 % CI 1.1–2.3); study B RR 2.4 (0.8–7.1).

Decide for each whether the null is compatible (A: excluded; B: included) and which study is more precise (narrower interval, A) ✓. Explain why B's larger estimate is weaker evidence (imprecision – the interval spans a protective to a strong harmful effect) ✓. State what “ $p > 0.05$ ” would mean for B (data compatible with no effect – absence of evidence, not evidence of absence) ✓.

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3.1

- A: CI excludes 1 – effect stands ✓.
- B: CI includes 1 – compatible with no effect ✓.
- A is more precise (narrower interval) ✓.
- B's interval spans 0.8–7.1: protective to strongly harmful – the estimate says little ✓.
- $p > 0.05$ for B = absence of evidence, not evidence of absence ✓.

Exercise 3.2

3.2 A synthetic survival cohort of 12 patients: at 3 months, 1 event among 12 at risk; at 6 months, 1 event among 10 at risk (one censored between); at 9 months, 2 events among 8 at risk.

Compute $S(3) = 11/12 \approx 0.917$, $S(6) = 0.917 \times 9/10 = 0.825$, $S(9) = 0.825 \times 6/8 = 0.619$ ✓. State where the median lies (after 9 months – S has not yet reached 0.50) and what censoring changed at 6 months (the denominator only) ✓. [7]

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- $S(3) = 11/12 = 0.917$ ✓.
- $S(6) = 0.917 \times 9/10 = 0.825$ ✓.
- $S(9) = 0.825 \times 6/8 = 0.619$ ✓.
- Median: after 9 months (S still above 0.50); censoring shrank only the at-risk denominator ✓.