12.5 Statistical inference for clinical data

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS confidence interval • p-value P

Objective

Decide with intervals; walk the survival steps.

1 Key knowledge and worked examples

■ The two habits

CI = compatible truths (size AND precision); p-value = surprise under the null ✓. Test follows data type: χ^2 · t · ANOVA · rank · correlation.

■ Worked example: the steps

10 patients: S(6 mo) = 9/10 = 0.90; one censored; S(12 mo) = 0.90 × 7/8 = 0.7875 ≈ 79 % ✓. Median = the 50 % crossing.

2 Practice

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]

3 Exam-style questions

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) ✓. [8]

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 ≈ 0.917, S(6) = 0.917 × 9/10 = 0.825, S(9) = 0.825 × 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]

Solutions

2.1

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

2.2

- The χ^2 test ✓.

2.3

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

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 ✓.

3.2

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

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