UNIVERSITY MEDICINE • EXERCISE SHEET

12.3 Bias, confounding and causation

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

KEY WORDS confounding • selection bias

Objective

Name the failure mode; run the stratification test.

1 Key knowledge and worked examples

■ **Three failures**

Selection bias (who counts), information/recall bias (what is measured or remembered), confounding (a third variable on both paths) ✓. Randomisation balances the unknowns prospectively.

■ **Worked example: the stratified verdict**

Crude RR 2.0 → strata RR 1.0 and 1.0: confounded; strata RR 2.0 and 1.9: the signal survives ✓. Hill's viewpoints judge causation, temporality first.

2 Practice

2.1 Sick patients recall exposures more keenly – name the bias. [3]

2.2 What must a confounder be associated with (two things)? [3]

2.3 Which Hill viewpoint is non-negotiable? [3]

3 Exam-style questions

3.1 A synthetic crude table: exposed 24/200 events; unexposed 12/200 (RR 2.0). Stratification by a third variable: stratum A 20/100 vs 10/100; stratum B 4/100 vs 2/100.

Compute the stratum RRs (2.0 and 2.0) ✓ and conclude that the third variable is NOT the confounder here (the association survives within strata) ✓. Explain what result WOULD have indicted the third variable (RR ≈ 1.0 inside every stratum) and why ✓. [8]

3.2 A fictional abstract: coffee drinkers show twice the disease rate.

List the three appraisal questions (who was selected; how was exposure measured; what confounder would need both links) ✓. Apply two Hill viewpoints (temporality: exposure measured before disease? dose-response: more coffee, more disease?) and state what each would demand ✓. [7]

Solutions

2.1

- Recall (information) bias – measurement differs by group ✓.

2.2

- The exposure AND the outcome – both paths ✓.

2.3

- Temporality – cause precedes effect ✓.

3.1

- Stratum A: 20/100 vs 10/100 → RR 2.0 ✓.
- Stratum B: 4/100 vs 2/100 → RR 2.0 ✓.
- The association survives within strata – the third variable is not the confounder ✓.
- Indictment needs RR collapsing toward 1.0 in every stratum – the crude association was then the mix of strata ✓.

3.2

- Who was selected (response rates, health-worker effect) ✓.
- How exposure was measured (recall differs by disease status) ✓.
- Confounder profile: linked to coffee AND to the outcome (e.g. smoking) ✓.
- Temporality demands exposure recorded before disease; dose-response demands rising risk with rising intake ✓.