

Types of study & design

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Peter Taylor Award long-list 2009

- Cross-sectional surveys of occupational groups – hazards and ill-health noted (2)
- Longitudinal analyses of routine employer data (2)
- Large case series assembled from employer data (2)
- Surveys of OPs' attitudes & practice (2)
- Randomised intervention trial (1)
- Before-and-after intervention study (1)
- *In vitro* experiment (1)
- National survey of service provision, with qualitative interviews in a sample (1)
- Methodological study of inter-observer agreement on case scenarios (1)

Other types of study?

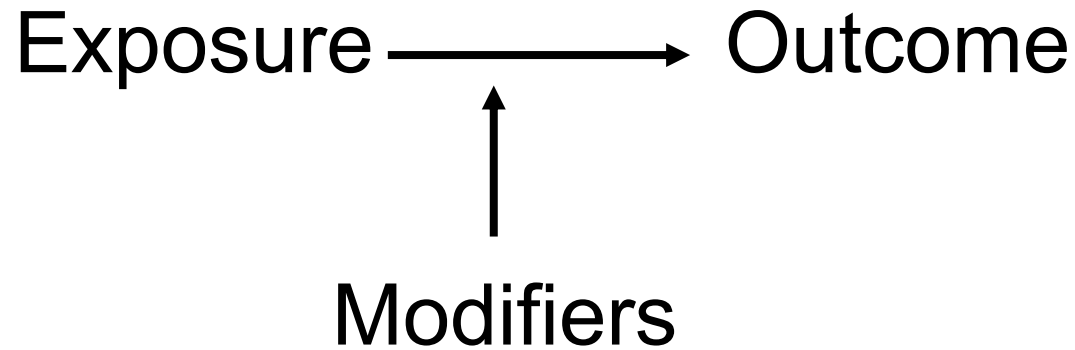
- Systematic reviews
- Audit
- Hospital or GP-based case-control studies
- Qualitative research
- Economic analyses
- Historical research

From FOM guidance ...

Research ideas commonly arise from:

- Everyday questions about practice
- Observed variations in practice
- Challenging/checking accepted practice, where it lacks an evidence base
- Topics of debate and controversy
- Apparent gaps in the evidence base

Conceptual framework



What is the causal hypothesis?

eg smoking → ischaemic heart disease

- Cumulative lifetime smoking?
- Maximal smoking per day?
- Smoking immediately before a cardiac event?

- Arteriosclerosis?
- Cardiac events?
- Cardiac disability?

Epidemiology

- *epi* = upon; *demos* = people; *logos* = study
- The study of the distribution and determinants of disease frequency in human populations
 - Groups; causal relationships

Uses of epidemiology

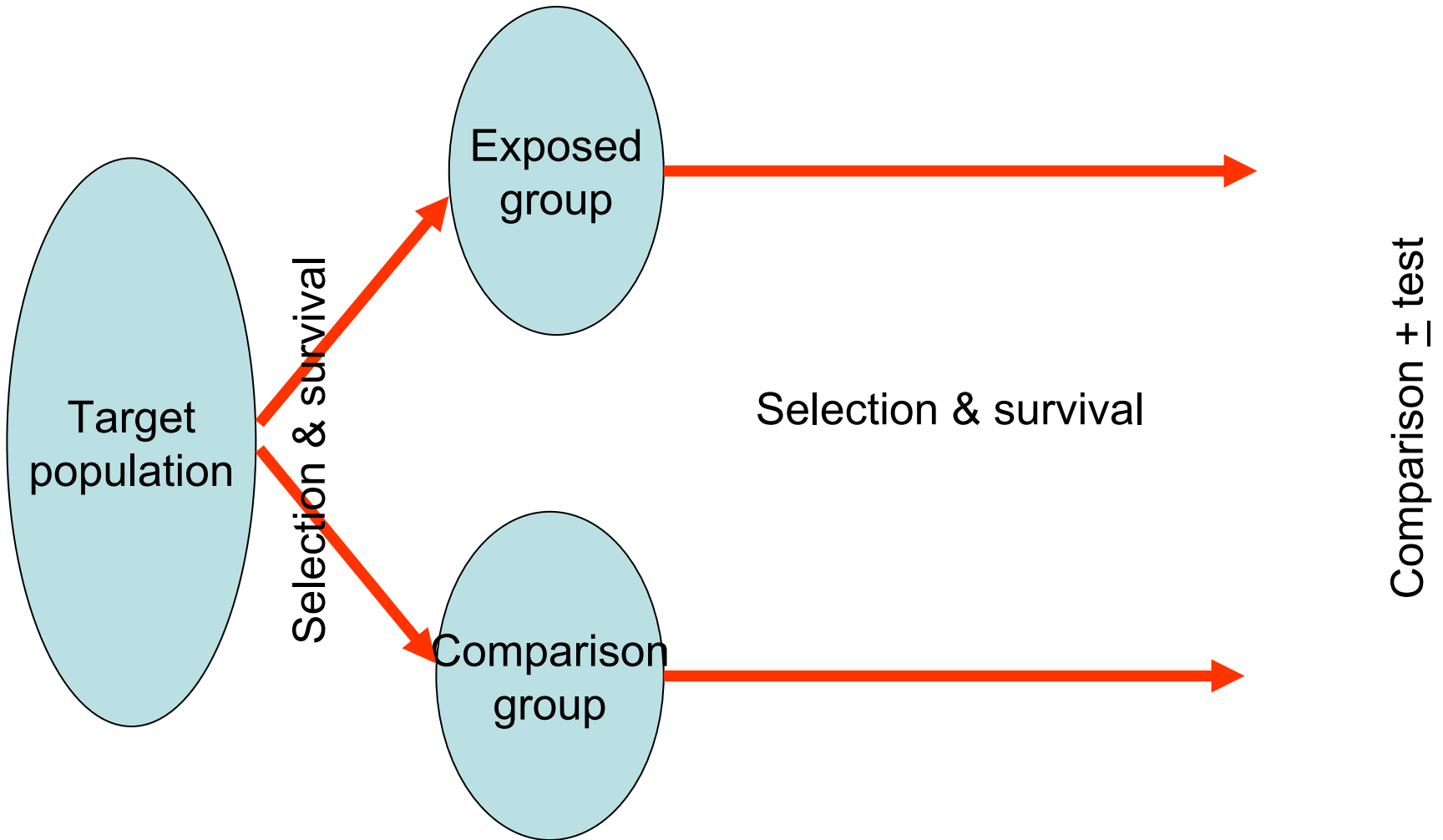
- Description
 - cf decennial national census
- Hypothesis generation
 - Differences
 - Similarities

} Time, place, person
- Analysis of causal factors, hypothesis testing
- Evaluation of interventions

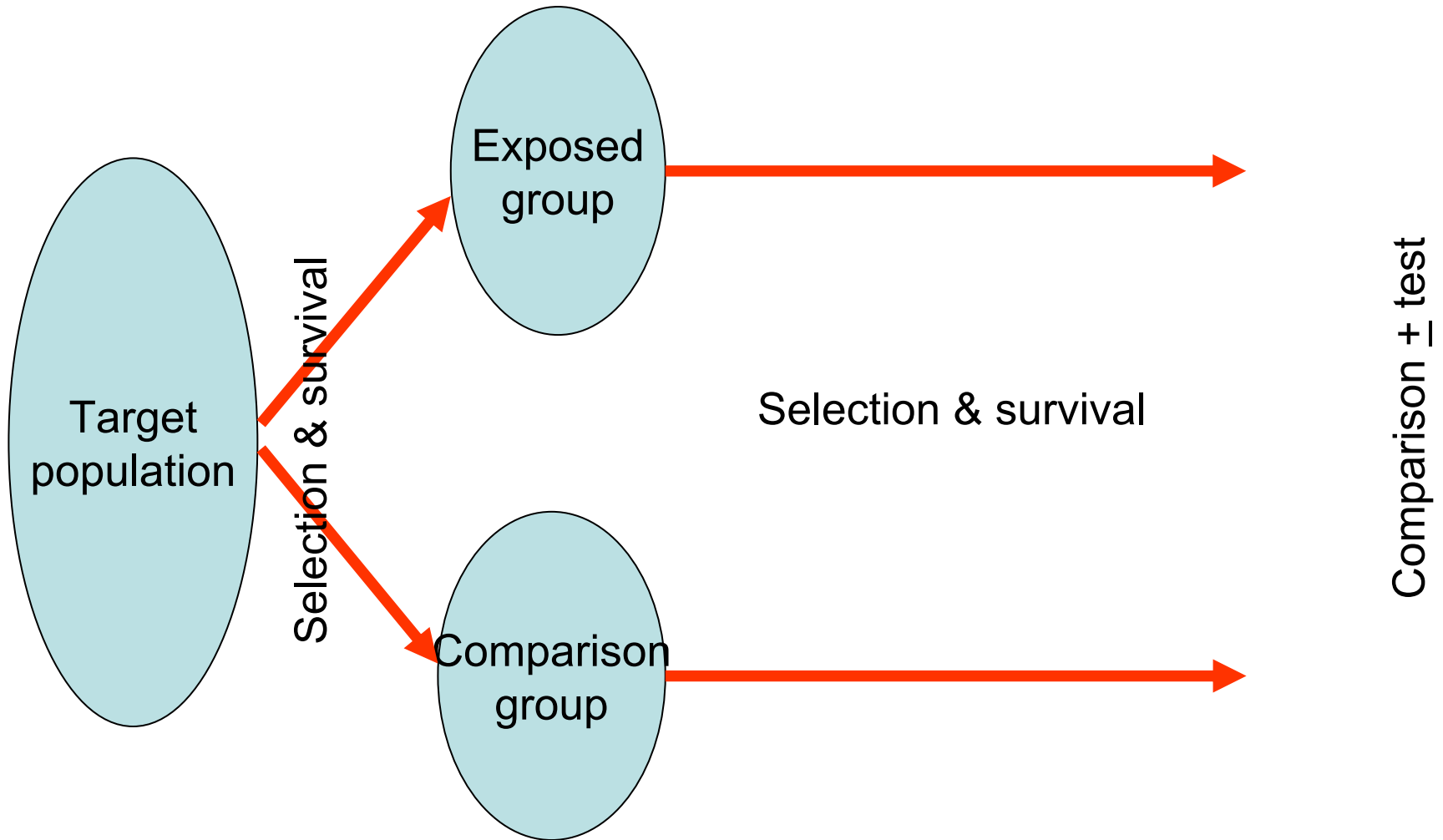
Epidemiological study design

- Longitudinal (prospective, follow-up, cohort, incidence)
- Cross-sectional (prevalence)
- Case-control (case-referent, retrospective)

Basic epidemiological design



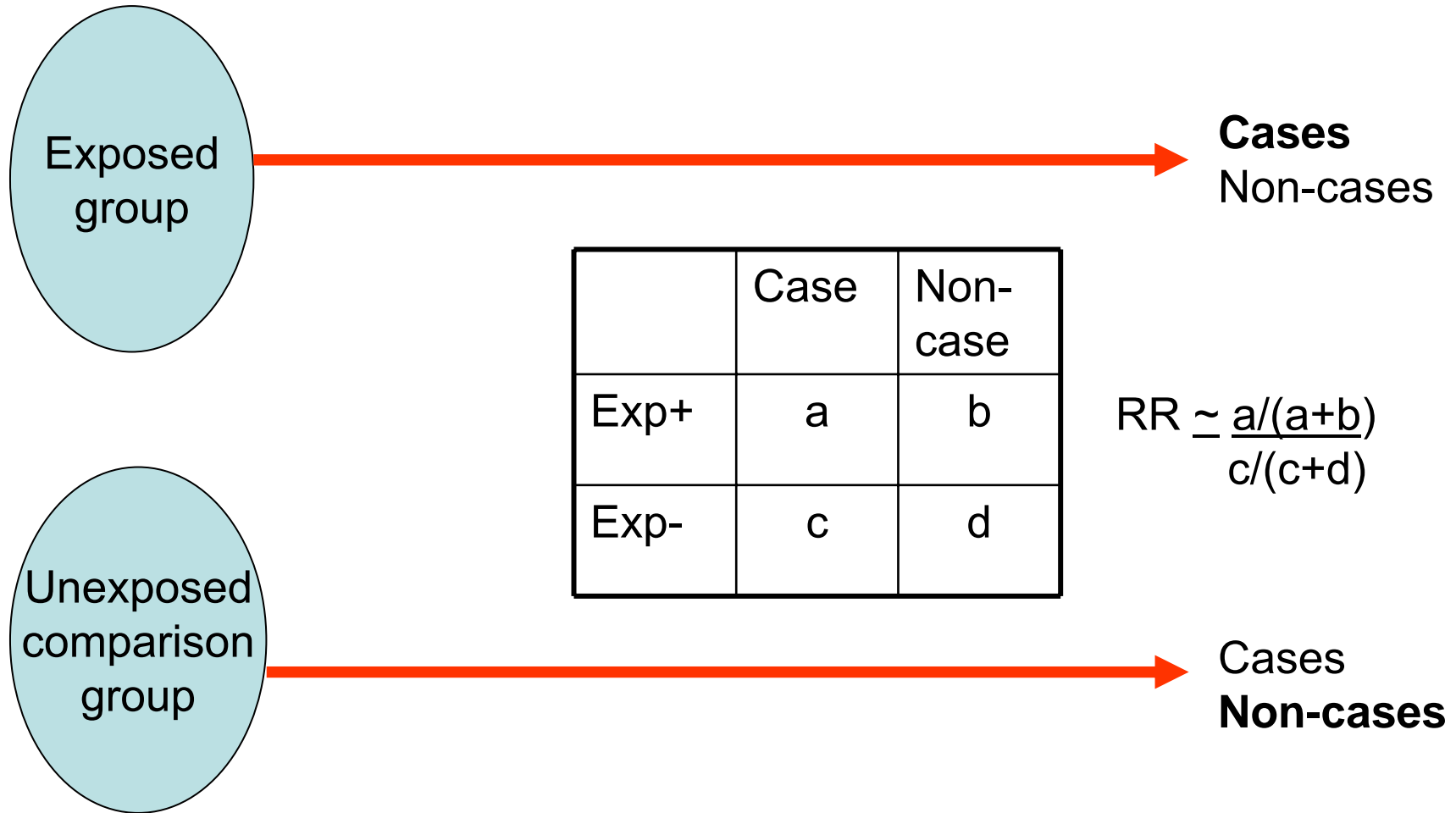
Basic longitudinal design



Even more basic longitudinal design



Basic longitudinal analysis



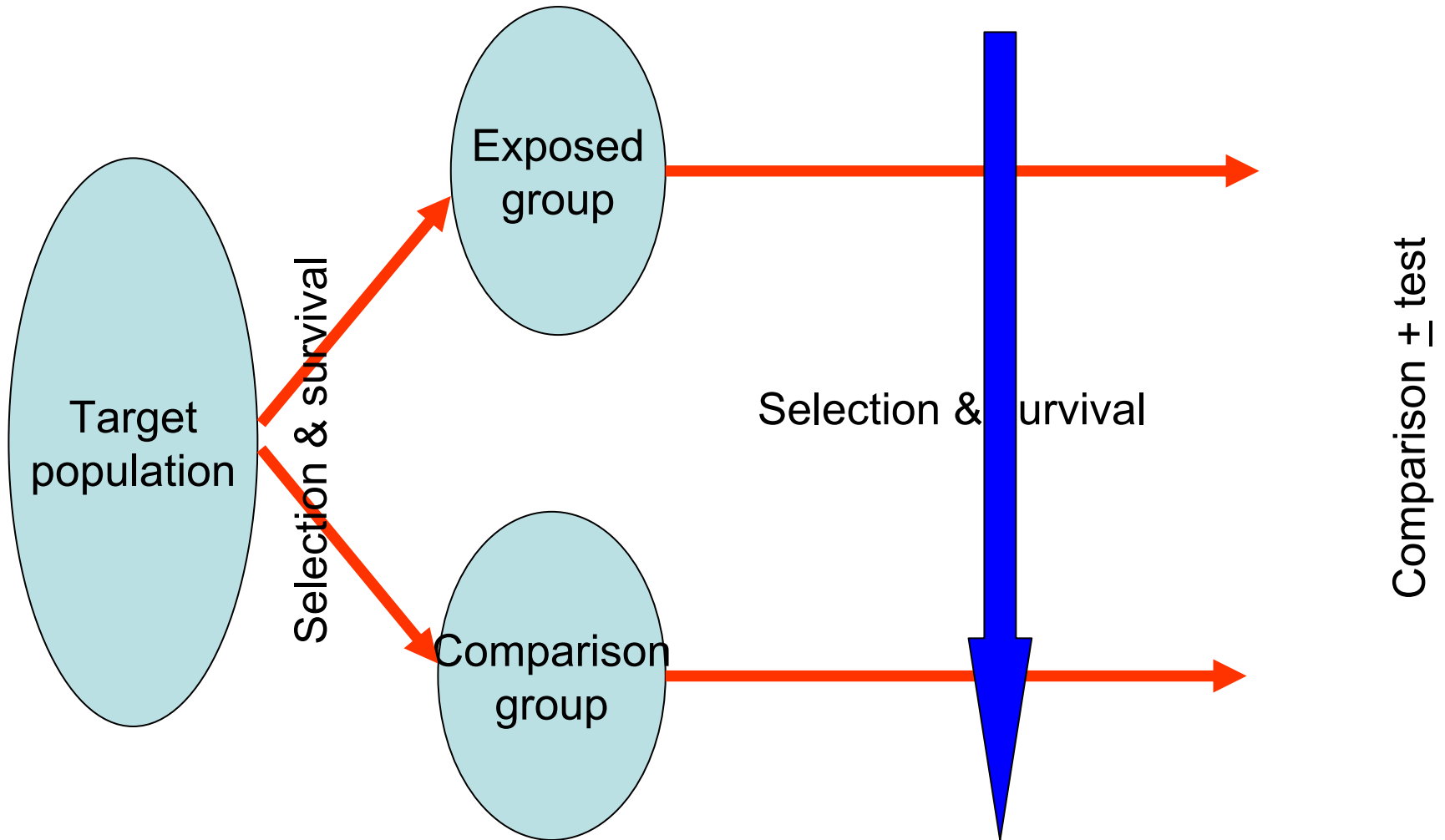
Case-control study

- Cases of disease
- Controls (referents) without disease
- Compare with respect to exposure (determinant)

Longitudinal vs case-control design

- Longitudinal – how common is the disease of interest amongst the exposed, relative to unexposed?
- Case-control – how common is the exposure amongst cases with disease, relative to non-cases?

Basic epidemiological design



Cross-sectional studies

- Studies of population cross-sections
- Measure what prevails at one point in time

Measurement in epidemiology: types of variable

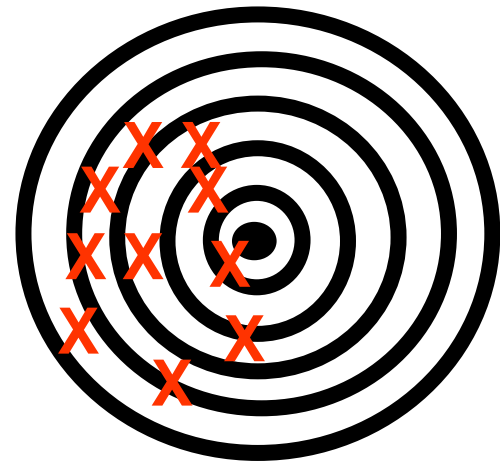
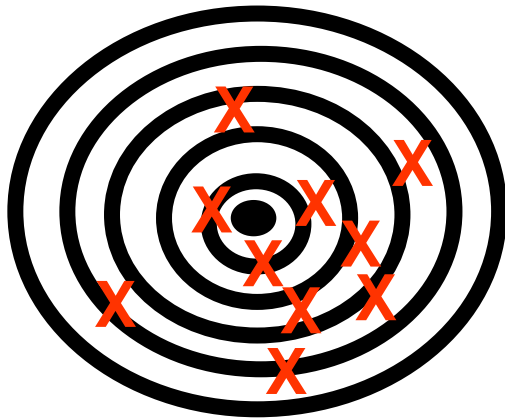
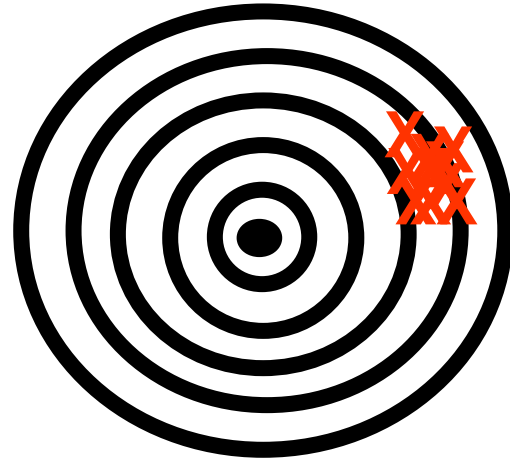
- Determininant
 - (independent, stimulus, exposure)
- Outcome
 - (dependent, response, disease)
- Modifying variables, including confounders
 - eg age, sex, smoking

Natural scales

- Continuous eg blood pressure
- Discrete eg cigarettes per day
- Ordinal eg high/medium/low/no exposure
- Categorical eg job titles
- Binary eg dead/alive

Validity and repeatability of chosen index

- **Validity:** does the index measure what it is supposed to measure?
 - Criterion – compared with the “gold standard”
- **Repeatability:** does it give similar findings on different occasions?



Common headings for protocols

- Background information – literature, practical
- Objectives – general, specific, practical action
- Design – including controls, power, strategy for increasing response rate
- Methods – including definitions, equipment, record forms, quality control, validity, results of piloting
- Record-keeping and analysis - including general lines of analysis
- Timetables – including data analysis
- Ethics, “politics”
- Resources – including staffing, equipment, other

Statistical power

- Crudely - the ability of a test to detect an effect, given that the effect actually exists
- Free software from Epi-Info (WHO)

Inference from observational studies

- Austin Bradford Hill. The environment and disease: association or causation?
Proc Roy Soc Med 1965;58;295-300
- Is there any other answer more likely than cause and effect?

- Strength of association
- Consistency in different studies
- Specificity of exposure, of disease
- Relationship in time
- Biological gradient
- Biological plausibility
- Coherence of all the evidence
- Experimental or semi-experimental evidence
- Reasoning by analogy

- **S** trength
- **C** onsistency
- **S** pecificity
- **T** ime
- **G** radient
- **P** lausibility
- **C** oherence
- **E** xperimental
- **A** nalogy

- Statistics
- Can
- Sometimes
- Teach
- Good
- Principles,
- Can
- Epidemiology
- Also?