Summary of talk

- What is critical appraisal?
- Why critical appraisal is important in occupational and environmental medicine
- Steps in critical appraisal of a paper
- Introduction to causal criteria
- Further reading
What is Critical Appraisal?

- Critical appraisal is a systematic approach to reading, understanding, interpreting, identifying the limitations of, and deciding upon the usefulness of, results of published and unpublished research papers and other sources of information from human studies.

- Series of points the reader should consider as s/he reads and tries to interpret findings and understand the meaning of a paper

- Don’t take a ‘checklist’ approach
Why is it important?

- For those who work in occupational health, questions constantly raised about work hazards causing ill-health, effectiveness of clinical and work interventions, screening tests, etc.

- Important skill for occupational and environmental physicians to be able to gauge the ‘evidence base’ to inform policy and occupational health practice.

- Epidemiological research, being observational rather than experimental, can have many limitations. We need to be able to understand these limitations and their impact on interpretation of the findings from human studies.
“In epidemiology there are rarely RIGHT answers, merely the most appropriate interpretation of observed phenomena”
Asthma in pesticide users: an update from the Great Britain Prospective Investigation of Pesticide Applicators’ Health (PIPAH) cohort study

David Fishwick, Anne-Helen Harding, Y Chen, Neil Pearce, Gillian Frost

ABSTRACT

Objectives. To define the prevalence and incidence of asthma in a large working population of pesticide workers and to assess which exposures are potentially of relevance to causing or aggravating the condition.

Methods. A baseline cross-sectional study at recruitment (2013–2017, n=567), with follow-up in 2018 (n=578), was carried out in predominantly Great Britain-based pesticide workers. At baseline, participants completed a health and work questionnaire which included questions on demographic, lifestyle, socioeconomic and work-related factors, pesticide use and doctor diagnosed health conditions. In January 2018, a follow-up questionnaire focused on respiratory health was completed by the participants. The associations of various exposures with asthma were examined using logistic regression adjusting for age as a continuous variable, and for sex where possible. An estimate of hours worked with pesticides in the previous year was calculated for each participant.

Results. At baseline, 668 (10.4%) had doctor diagnosed asthma. In 2018 the figure was 257 (11.5%) of the follow-up population. The incidence of new asthma cases between surveys was 1.7 cases per 1000 participants per year. At follow-up, 18.1% reported wheeze in the last 12 months, 77.7% of those with self-reported asthma noted it to be persistent and using a more specific definition of asthma (doctor diagnosed asthma with at least one asthma-related symptom in the last year), 68% (95% CI 5.9% to 7.9%) fulfilled this definition. At follow-up, 127 participants felt that their asthma was caused or made worse by their work, with 57 (53.6%) reporting organic dust, 13 (10.3%) unspecified dust, 12 (9.9%) chemicals, 9 (7.9%) physical agents and 3 (2.5%) fumes or other irritants. There was little or no association between high pesticide exposure and doctor diagnosed asthma or self-reported asthma, although there was an elevated risk for work-related wheezing (OR for high exposure: 2.67, 95% CI 1.16 to 6.18). High pesticide exposure (high vs low exposure category OR 2.68, 95% CI 1.28 to 5.69) was also associated with work-related chest tightness. Exposure to organic dust was associated (p=0.02) with persistent asthma when adjusted for the effects of age and smoking.

Conclusions. This large study of pesticide workers has identified expected levels of doctor diagnosed asthma, and high levels of self-reported respiratory symptoms.

First step?
First step

- Read the abstract or summary
- Gives a concise overview of what the paper or report is about
- Tells if relevant to the topic you are interested in
- Will generally cover the good points of the paper
- If you want to refer to the paper, don’t just rely on the abstract or summary as it doesn’t contain sufficient information to fully evaluate the paper
What is the Research Question?

- A very important part of any paper
- How clearly is it stated by the authors?
- Needs to be as specific as possible
- Guides the methodology for the study, data analysis and conclusions
- ‘Road map’ for the research
- Avoid the ‘Columbus phenomenon’
What is the Study design

- Should be explicitly stated in the paper
- Clinical/Intervention trial - experimental
- Cohort study (prospective/historical)
- Registry study
- Case-control study
- Cross-sectional study
- Ecological study
- Case series/ case report
- Is the design appropriate for the research objectives?
- What are limitations?
How was the study group defined?

- Is it a sample of a larger population?
- If so, what sampling approach was used?
- Is the sample representative of the larger population? How generalisable?
- How was the sample size decided upon?
- Was there a sample size calculation, based on statistical power?
- Were there any inclusion/exclusion criteria?
- What were the response rate and drop out rate?
- What do we know of non-participants?
How was the comparison group defined?

- **ALWAYS** need a comparison group in epidemiology
- How were they defined?
- What was the source of the controls? Population based, hospital, geographical etc
- Was it a sample?
- Were they matched in some way?
- How comparable were they to the study group?
- Should be similar in most ways, except for the exposure variable(s)
How were the health outcomes measured?

- What measurements were used?
- How valid are they in measuring what we want them to measure? Any objective check?
- How reproducible are the measures?
- Were subjects and observers blinded to exposure?
- What quality control was used?
- Completeness of data?
Exposure measures

- Very important factor in occupational and environmental epidemiological studies
- How was exposure measured?
- Were individual or population data used?
- Information collected directly from individuals or from records?
- Environmental or personal measures?
- How complete are the exposure data, especially for retrospective studies?
- How likely is misclassification bias and what impact could it have?
How was the analysis done?

- What statistical methods were used?
- Were these appropriate for the type of study?
- What level of statistical significance was used?
- Were there too many analyses, which would increase the risk of chance findings? Type 1 error.
- Multiple comparisons problem – $p < 0.05$
How were the findings presented?

- Tables/figures help to organise the findings
- Are there clear tables and figures?
- Are there clear titles, headings, footnotes etc?
- Are there too much or too little presented data to answer the research question(s)?
- Data should not be in both tables and the text - key findings in the text
- Make your own assessment of presented results
Confounding factors?

- A confounder is a possible third factor related to both the exposure and the outcome variable which is not in the causal pathway.
- Therefore, confounders could be an alternative explanation for positive findings.
- Authors need to have excluded major possible confounders to conclude that the exposure and health outcome are associated.
- May be unknown confounders acting!
- Can adjust for these in analyses (to a point)
Could biases explain the findings?

- Bias is systematic error
- More serious than random error and more difficult to assess and control for
- Selection bias
- Participation bias
- Survivor bias
- Observer bias
- Information/recall bias
- Many more - authors should discuss possible direction and implications
Making a judgement

- What were the main findings?
- Could these be explained by chance, confounding or bias?
- If not, then conclude there is an association
- Next question is how do the results fit in with other known information about this particular topic?
- How will these findings influence our thinking on this topic?
Association or causation?

- In aetiological studies, just because we have found an association, doesn’t mean that a causal link has been proven.
- There is a series of further points we need to consider, before we can make conclusions about a causal link.
- Bradford Hill’s causal criteria.
Bradford Hill Criteria

- Strength of the association
- Consistency
- Dose-response gradient
- Temporality
- Specificity
- Biological plausibility
- Coherence
- Experiment
- Analogy
Further reading

