

The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Nonrandomized Studies in Meta- Analysis

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Background

- Observational studies – aetiological hypotheses (small RR but large PAF)
- Systematic review methodology (inc. meta-analysis) attractive – precise estimate when magnitude of risk is small
- Caution required (susceptibility to bias)!

Bias and Confounding

- “...thorough consideration of sources of heterogeneity between observational study results...” Egger et al, 2003

Newcastle-Ottawa Scale

“Easy, convenient tool for quality assessment of non-randomised studies”

Newcastle-Ottawa Scale

Case-Control Studies and Cohort Studies

Star system based on three domains:

- 1) Selection of Study Groups
- 2) Comparability of Groups
- 3) Ascertainment of exposure/ outcome

Development: Grouping Items

- Cohort studies
 - Selection of cohorts
 - Comparability of cohorts
 - Assessment of outcome
- Case-Control studies
 - Selection of case and controls
 - Comparability of cases and controls
 - Ascertainment of exposure

Development: Identifying Items

- Identify 'high' quality choices with a 'star'
- A maximum of one 'star' for each item within the 'Selection' and 'Exposure/Outcome' categories; maximum of two 'stars' for 'Comparability'

Current Development: Validity

- Face/content validity
- Criterion validity
- Construct validity
- Inter and Intra-rater Reliability

Future Development: Scoring

- Identify threshold score distinguishing between 'good' and 'poor' quality studies

NEWCASTLE - OTTAWA QUALITY ASSESSMENT SCALE CASE CONTROL STUDIES

Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Exposure categories. A maximum of two stars can be given for Comparability.

Selection

- 1) Is the case definition adequate?
 - a) yes, with independent validation
 - b) yes, eg record linkage or based on self reports
 - c) no description
- 2) Representativeness of the cases
 - a) consecutive or obviously representative series of cases
 - b) potential for selection biases or not stated
- 3) Selection of Controls
 - a) community controls
 - b) hospital controls
 - c) no description
- 4) Definition of Controls
 - a) no history of disease (endpoint)
 - b) no description of source

Comparability

- 1) Comparability of cases and controls on the basis of the design or analysis
 - a) study controls for _____ (Select the most important factor.)
 - b) study controls for any additional factor (This criteria could be modified to indicate specific control for a second important factor.)

Exposure

- 1) Ascertainment of exposure
 - a) secure record (eg surgical records)
 - b) structured interview where blind to case/control status
 - c) interview not blinded to case/control status
 - d) written self report or medical record only
 - e) no description
- 2) Same method of ascertainment for cases and controls
 - a) yes
 - b) no
- 3) Non-Response rate
 - a) same rate for both groups
 - b) non respondents described
 - c) rate different and no designation

Newcastle-Ottawa Quality Assessment Scale: Case-Control Studies

- Selection (4)
 - Comparability (1)
 - Exposure (3)
- A study can be awarded a maximum of one star for each numbered item within the Selection and Exposure categories. A maximum of two stars can be given for Comparability

Selection

1. Is the case definition adequate?
 - a) yes, with independent validation ♦
 - b) yes, eg record linkage or based on self reports
 - c) no description
2. Representativeness of the cases
 - a) consecutive or obviously representative series of cases ♦
 - b) potential for selection biases or not stated
3. Selection of Controls
 - a) community controls ♦
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1. Comparability of cases and controls on the basis of the design or analysis
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NEWCASTLE - OTTAWA QUALITY ASSESSMENT SCALE
COHORT STUDIES

Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability

Selection

- 1) Representativeness of the exposed cohort
 - a) truly representative of the average _____ (describe) in the community
 - b) somewhat representative of the average _____ in the community
 - c) selected group of users eg nurses, volunteers
 - d) no description of the derivation of the cohort
- 2) Selection of the non-exposed cohort
 - a) drawn from the same community as the exposed cohort
 - b) drawn from a different source
 - c) no description of the derivation of the non exposed cohort
- 3) Ascertainment of exposure
 - a) secure record (eg surgical records)
 - b) structured interview
 - c) written self report
 - d) no description
- 4) Demonstration that outcome of interest was not present at start of study
 - a) yes
 - b) no

Comparability

- 1) Comparability of cohorts on the basis of the design or analysis
 - a) study controls for _____ (select the most important factor)
 - b) study controls for any additional factor (This criteria could be modified to indicate specific control for a second important factor.)

Outcome

- 1) Assessment of outcome
 - a) independent blind assessment
 - b) record linkage
 - c) self report
 - d) no description
- 2) Was follow-up long enough for outcomes to occur
 - a) yes (select an adequate follow up period for outcome of interest)
 - b) no
- 3) Adequacy of follow up of cohorts
 - a) complete follow up - all subjects accounted for
 - b) subjects lost to follow up unlikely to introduce bias - small number lost -> ____ % (select an adequate %) follow up, or description provided of those lost
 - c) follow up rate < ____% (select an adequate %) and no description of those lost
 - d) no statement

Newcastle-Ottawa Quality Assessment Scale: Cohort Studies

- Selection (4)
- Comparability (1)
- Outcome (3)

– A study can be awarded a maximum of one star for each numbered item within the Selection and outcome categories. A maximum of two stars can be given for Comparability

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1. Representativeness of the exposed cohort
 - a) truly representative of the average _____ (describe) in the community ♦
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1. Assessment of outcome
 - a) independent blind assessment ♦
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2. Was follow up long enough for outcomes to occur
 - a) yes (select an adequate follow up period for outcome of interest) ♦
 - b) no

3. Adequacy of follow up of cohorts
 - a) complete follow up - all subjects accounted for ♦
 - b) subjects lost to follow up unlikely to introduce bias - small number lost - > ___ % (select an adequate %) follow up, or description of those lost) ♦
 - c) follow up rate < ___ % (select an adequate %) and no description of those lost
 - d) no statement

Risk of Low Birth Weight and Stillbirth Associated With Indoor Air Pollution From Solid Fuel Use in Developing Countries

Pope D, Epidemiologic Reviews, 2010



Steps of a Cochrane Systematic Review

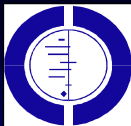
- Clearly formulated question
- Comprehensive data search
- Unbiased selection and abstraction process
- Critical appraisal of data
- Synthesis of data
- Perform sensitivity and subgroup analyses if appropriate and possible
- Prepare a structured report

Objective

- Quantify the association between exposure to indoor air pollution and low birth weight

Inclusion Criteria

- Types of studies
 - All study designs (intervention; observational)
- Population
 - Live singleton births
- Exposure
 - Any reporting of exposure to IAP (including solid fuel use etc)
- Outcomes
 - Studies reporting actual birth weight or LBW (<2500g)

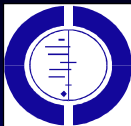


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Search Strategy

- Electronic Search of:
 - MEDLINE
 - EMBASE
 - Cochrane Controlled Trials Register
 - CINAHL
 - LILACS
- Other Data Sources:
 - Grey literature (PASCAL, ICP)
 - Contact with experts, review of references cited in retrieved articles



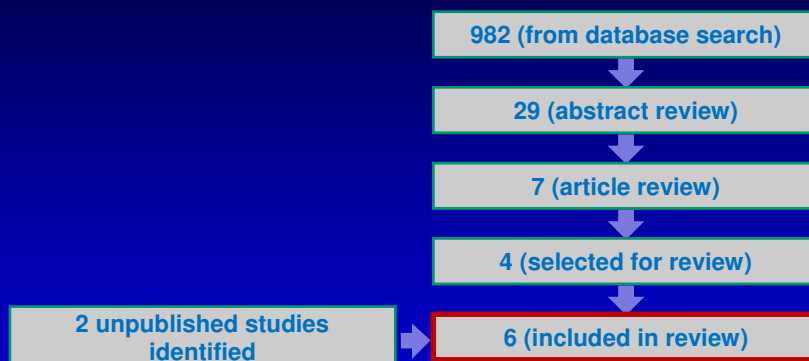
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Data Extraction

- 2 independent reviewers selected studies
- 2 independent reviewers extracted data using pre-determined forms
 - study design
 - population characteristics
 - Exposure (IAP)
 - Outcomes (LBW)
 - results
- differences resolved by consensus

Results





Steps of a Cochrane Systematic Review

- Clearly formulated question
- Comprehensive data search
- Unbiased selection and abstraction process
- Critical appraisal of data
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- Prepare a structured report

Studies included:

- 6 studies for data extraction (from 982)
- 2 cohort
 - 2 cross-sectional
 - 1 case-control
 - 1 intervention study

Quality assessment:

Selection – 4 stars:

*(representativeness; exposure assessment – cohort/
cross-sectional; control selection – case-control)*

Comparability – 2 stars:

*(adjustment for main/ additional confounders eg. active/
passive maternal smoking, gestational age, nutrition
etc)*

Outcome/ Exposure – 3 stars:

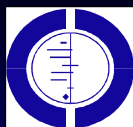
*(adequacy of outcome (measured LBW) and exposure
(indoor air pollution – measured vs self-report)*

Quality assessment:

	Selection	Comparability	Outcome/ Exposure
Boy, 2002 (CS)	★★★★	★	★★★
Mavalankar, 1992 (CC)	★★★		★★★
Mishra, 2004 (CS)	★★	★	★★
Siddiqui, 2008 (C)	★★	★★	★★★★
Tielsch, 2009 (C)	★★★★★	★★	★★★★
Thompson, 2005 (RCT)	★★★	★★	★★

Quality assessment:

	Selection	Comparability	Outcome/ Exposure
Boy, 2002 (CS)	★★★★	★	★★★
Mavalankar, 1992 (CC)	★★★		★★★
Mishra, 2004 (CS)	★★	★	★★
Siddiqui, 2008 (C)	★★	★★	★★★
Tielsch, 2009 (C)	★★★★	★★	★★★
Thompson, 2005 (RCT)	★★★	★★	★★



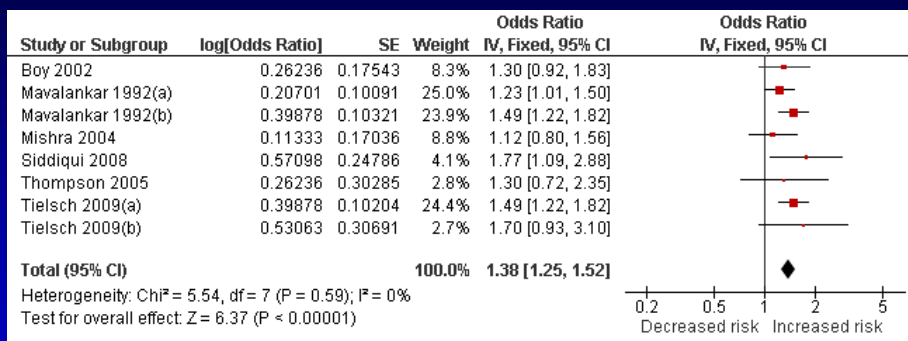
Steps of a Cochrane Systematic Review

- Clearly formulated question
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Quantification of Effects

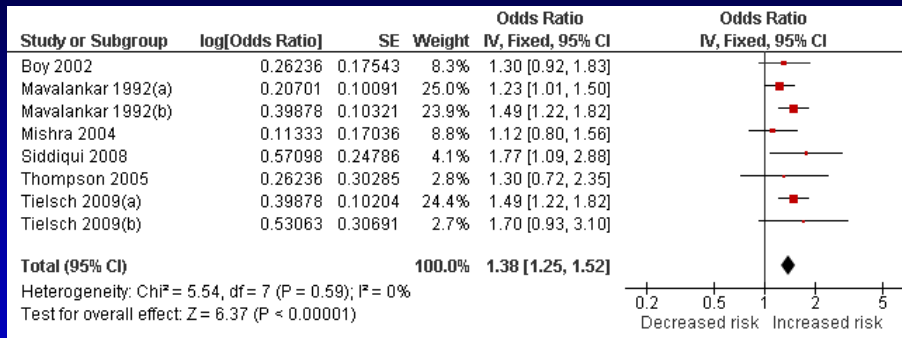
- Exposure (e.g. solid fuel vs clean fuel)
- Outcome (%LBW)
- Effect estimates (EE)
 - Relative Risk (RR)
 - Odds Ratio (OR)
- Fixed-effect meta-analysis in the absence of statistical heterogeneity

% Low Birth Weight (<2500g): 6 studies, 8 estimates



OR = 1.38 (1.25, 1.52), $p < 0.0001$

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OR = 1.38 (1.25, 1.52), $p < 0.0001$

OR = 1.41 (1.27, 1.56) (exclude poor quality)

Interpretation Crucial:

- Exclusion from sensitivity analysis based on (i) birth weight based on self-reports (50%), (ii) no information on gestational age and (iii) unadjusted analysis

Applications:

- Assess quality of nonrandomized studies
- Incorporate assessments in interpretation of meta-analytic results
- Valid, repeatable and simple
- Limitations:
 - Study Designs → Too Simplistic

The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Nonrandomized Studies in Meta- Analysis

www.lri.ca

NOS Quality Assessment Scales:

Case-control studies

Cohort studies

Manual for NOS Scales

Recommended Reading....

