Conducting a Systematic Review

Dr Kristine Pezdiric, Tracy Schumacher, Katherine Brain and Debbie Booth

School of Health Sciences
Faculty of Health and Medicine

Acknowledgements: Dr Melinda Hutchesson and Dr Tracy Burrows
Professor Clare Collins
Professor in Nutrition and Dietetics

- Director of Research, School of Health Sciences, Faculty of Health and Medicine
- Deputy Director, Priority Research Centre in Physical Activity and Nutrition
- National Health and Medical Research Council Senior Research Fellow (2016-2020)

**Research areas:**
- Influence of nutrition across life stages and health conditions
- Assessing dietary intake and diet quality, including technology, *Healthy Eating Quiz™* and *Australian Eating Survey®*
- Interventions to promote healthy eating and healthy weight; HIKCUPS, Back-to-Basics, SHED-IT, Healthy Dads Healthy Kids, NEAT girls, MADE for Life, Bounce Back Baby, CHEQ-UP, HEYMAN, VITAL

**Dietitians Association of Australia:** DAA Fellow, Media Spokesperson since 1999

**Consultant:** So You Think You Can Dance, The Biggest Loser, The Bachelor, Australian Survivor
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Overview

Session Outline

1. Background
2. Planning for a systematic review
3. Protocol
4. Conduct your search
5. Screening process
6. Data extraction
7. Study quality
8. Data synthesis
9. Draft your review
10. Question time
1. Background

**What is a systematic review?**

- A process of systematically locating, appraising and synthesising evidence from scientific studies to obtain a reliable overview.
- It is often the first and essential step in the research process.

A "systematic review" therefore aims to be:

- Systematic (e.g. in its identification of literature)
- Explicit (e.g. in its statement of objectives, materials and methods)
- Reproducible (e.g. in its methodology and conclusions)
1. Background

Why do a systematic review?

1. Summarises best available evidence
2. Determine what is already known about your proposed research topic/question
3. To identify research gaps and priorities for generating new evidence to fill these gaps
4. Highest level of the evidence hierarchy (NHMRC Level I)
5. Informs clinical practice guidelines/PhD thesis
6. May get published in a high impact journal
7. Gets lots of citations
8. To showcase your research
2. Planning for a systematic review

Some tips for managing the process

• Form a team, you cannot do it by yourself
• Be prepared for the time commitment and be organised
  – Have a plan, set a timeline*
  – Keep good records
  – *Can take longer than anticipated
• Link it to a research study or research higher degree, or clinical practice or development of clinical guidelines
• Consider applying for funding
2. Planning for a systematic review

1. Develop Protocol
2. Conduct search and determine study inclusion
3. Data extraction
4. Assess study quality
5. Data synthesis (narrative &/or quantitative)
6. Complete manuscript
3. Protocol

The first step is to write your protocol - method

Includes:
1. Objectives/Review Question
2. Inclusion criteria
3. Search strategy
4. Data collection/extraction
5. Study quality
6. Data synthesis
3. Protocol

Should you register your protocol?

• High quality systematic reviews register their protocols prior to commencing
• Some journals require you to have your protocol registered

PROSPERO
www.crd.york.ac.uk/prospero

Cochrane Collaboration
http://www.cochrane.org/cochrane-reviews/registering-titles

The Joanna Briggs Institute
http://joannabriggs.org/research/registered_titles.aspx
3. Protocol

Preferred Reporting items for Systematic reviews and Meta-Analyses: The PRISMA Statement

• Is essential reading before starting a systematic review.

• Editors of journals increasingly expect systematic reviews to use PRISMA or similar guidelines.

• The PRISMA Checklist will guide you on how to develop a systematic review protocol and what to include when writing up your review.

• http://prisma-statement.org/
<table>
<thead>
<tr>
<th>Section/topic</th>
<th>#</th>
<th>Checklist item</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>1</td>
<td>Identify the report as a systematic review, meta-analysis, or both.</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structured summary</td>
<td>2</td>
<td>Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rationale</td>
<td>3</td>
<td>Describe the rationale for the review in the context of what is already known.</td>
</tr>
<tr>
<td>Objectives</td>
<td>4</td>
<td>Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).</td>
</tr>
<tr>
<td>METHODS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol and registration</td>
<td>5</td>
<td>Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.</td>
</tr>
<tr>
<td>Eligibility criteria</td>
<td>6</td>
<td>Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.</td>
</tr>
<tr>
<td>Information sources</td>
<td>7</td>
<td>Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.</td>
</tr>
<tr>
<td>Search</td>
<td>8</td>
<td>Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.</td>
</tr>
<tr>
<td>Study selection</td>
<td>9</td>
<td>State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).</td>
</tr>
<tr>
<td>Data collection process</td>
<td>10</td>
<td>Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.</td>
</tr>
<tr>
<td>Data items</td>
<td>11</td>
<td>List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.</td>
</tr>
<tr>
<td>Risk of bias in individual studies</td>
<td>12</td>
<td>Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.</td>
</tr>
<tr>
<td>Summary measures</td>
<td>13</td>
<td>State the principal summary measures (e.g., risk ratio, difference in means).</td>
</tr>
<tr>
<td>Synthesis of results</td>
<td>14</td>
<td>Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I²) for each meta-analysis.</td>
</tr>
</tbody>
</table>
# PRISMA 2009 Checklist

<table>
<thead>
<tr>
<th>Section/topic</th>
<th>#</th>
<th>Checklist item</th>
<th>Reported on page #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of bias across studies</td>
<td>15</td>
<td>Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).</td>
<td></td>
</tr>
<tr>
<td>Additional analyses</td>
<td>16</td>
<td>Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.</td>
<td></td>
</tr>
<tr>
<td><strong>RESULTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study selection</td>
<td>17</td>
<td>Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.</td>
<td></td>
</tr>
<tr>
<td>Study characteristics</td>
<td>18</td>
<td>For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.</td>
<td></td>
</tr>
<tr>
<td>Risk of bias within studies</td>
<td>19</td>
<td>Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).</td>
<td></td>
</tr>
<tr>
<td>Results of individual studies</td>
<td>20</td>
<td>For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.</td>
<td></td>
</tr>
<tr>
<td>Synthesis of results</td>
<td>21</td>
<td>Present results of each meta-analysis done, including confidence intervals and measures of consistency.</td>
<td></td>
</tr>
<tr>
<td>Risk of bias across studies</td>
<td>22</td>
<td>Present results of any assessment of risk of bias across studies (see Item 15).</td>
<td></td>
</tr>
<tr>
<td>Additional analysis</td>
<td>23</td>
<td>Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).</td>
<td></td>
</tr>
<tr>
<td><strong>DISCUSSION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary of evidence</td>
<td>24</td>
<td>Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).</td>
<td></td>
</tr>
<tr>
<td>Limitations</td>
<td>25</td>
<td>Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).</td>
<td></td>
</tr>
<tr>
<td>Conclusions</td>
<td>26</td>
<td>Provide a general interpretation of the results in the context of other evidence, and implications for future research.</td>
<td></td>
</tr>
<tr>
<td><strong>FUNDING</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funding</td>
<td>27</td>
<td>Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.</td>
<td></td>
</tr>
</tbody>
</table>


For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org)
3. Protocol

What is your objective (review question)?

• It is important to define your question clearly
• What are you trying to find out?
• It should be precise
• It should help to identify studies to include in the review

**Check that your question has not already been the subject of a systematic review**

• E.g. To assess the effects of [an intervention or comparison] for [a health problem] in [types of people and disease or problem and setting, if possible].

E.g. To assess the effect of [smoking cessation interventions] on [dietary intake] in [adults].
3. Protocol

Inclusion criteria

- Having a clear inclusion criteria simplifies every other step of the review
- Your review question should identify the type of:
  - Participant,
  - Intervention,
  - Comparators condition
  - Outcomes
  - Studies

- Referred to as the *PICOS statement*
3. Protocol

Types of participants

• How is the disease/condition defined?

• What are the most important characteristics that describe the participants?

• Are there any relevant demographic factors (e.g. age, sex, ethnicity)?

• What is the setting (e.g. hospital, community etc)?

• Who should make the diagnosis?

• Are there other types of people who should be excluded from the review?

• How will studies involving only a subset of relevant participants be handled?

  • Adults ≥18 years (legal age for smoking, however consider that until 2007 the legal age in the UK was 16 years)
3. Protocol

Types of interventions

• What are the experimental and control interventions of interest?
• Does the intervention have variations (e.g. dosage / intensity, mode of delivery, personnel who deliver it, frequency / duration / timing of delivery)?
• Are all variations to be included?
• How will trials where you are only interested in including part of the intervention be handled?
• What about trials with more than 1 intervention combined with another intervention (e.g. diet + exercise)?

• Intervention: online or face-to-face smoking cessation program (alone or in addition to nicotine replacement products)
• Comparator: No-intervention control group or nicotine replacement products ONLY
3. Protocol

Types of Outcomes

• Main outcome is ESSENTIAL

• Primary outcomes can be 1, 2 or 3 main outcomes used to reach a conclusion about the intervention(s) effects (i.e. beneficial, adverse, no effect)

• Secondary outcomes are the remaining “extra” outcomes useful for explaining intervention effects

• Consider outcomes relevant to all potential decision makers, including economic data

• Consider the type and timing of outcome measurements

- PRIMARY: Dietary intake - changes in nutrient intake, food groups, food-scores, servings, energy intake

- SECONDARY: Dietary behaviour - changes in emotional eating
3. Protocol

Types of studies

• What study designs are likely to provide reliable data to address the review’s objectives?

• Consider randomised controlled trials (RCT) and other study designs if no RCTs, such as non-randomised controlled trials, before-after (pre-post) studies.

• Non-RCTs can be included in a narrative summary to identify best available evidence regarding effectiveness of web-based interventions for weight loss or maintenance.

• If non-RCTs report useful data, they can be tabulated quantitatively

• RCTs, pseudo-RCT, non-randomized experimental trials, interrupted time series with a control group, historical control studies, cohort studies, case-control studies
4. Conduct your search

How will you find the “studies” that meet your inclusion criteria?

- Need to define:
  - sources to be searched
  - search process
  - selecting studies for inclusion
- You will need to develop a process to document each of these steps
- You need to talk to your Faculty Librarian at this stage of the review, but don’t go empty handed
4. Conduct your search

**Brainstorm**

- Think about the sources you will search:
  - Databases of control trials and systematic reviews (e.g. CENTRAL, Cochrane)
  - Key study databases (e.g. MEDLINE)
  - Subject specific databases
  - Citation indexes (e.g. Web of Science)
  - Dissertation/theses databases (e.g. Dissertations & Theses)
  - “Grey literature” (e.g. conference abstracts)
  - Best practice guidelines (e.g. NHMRC)
  - Hand searches (if not available electronically)
  - Reference list search (of all retrieved or included studies)
4. Conduct your search

Brainstorm

• Think about the search terms

- To assess the effect of [smoking cessation interventions] on [dietary intake] in [adults].

<table>
<thead>
<tr>
<th>Smoking</th>
<th>Dietary Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>Diet</td>
</tr>
<tr>
<td>“Tobacco use”</td>
<td>Nutrition</td>
</tr>
<tr>
<td>“Tobacco smoking”</td>
<td>Energy Intake</td>
</tr>
<tr>
<td>Smoking</td>
<td>Nutrient/Food/Dietary Intake</td>
</tr>
<tr>
<td>“cigarette smoking”</td>
<td>Food consumption</td>
</tr>
<tr>
<td>Smoker</td>
<td>Dietary pattern</td>
</tr>
</tbody>
</table>
4. Conduct your search

**Brainstorm**

- Think about the truncation and Boolean operators
- Think about the limits:
  - Participants: Human adults only due to legal age of smoking, but also consider that until 2007, the legal age for smoking in the UK was 16 years
  - Time frame: If obesity, the epidemic spans 1985-Current
  - Language: English or will you include others as well
- Consider testing your search in a database (e.g. MEDLINE) to see how many results you get
4. Conduct your search

<table>
<thead>
<tr>
<th>Searches</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco/</td>
<td>26044</td>
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<tr>
<td>&quot;tobacco use&quot;.mp.</td>
<td>18927</td>
</tr>
<tr>
<td>&quot;tobacco smoking&quot;.mp.</td>
<td>5011</td>
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<tr>
<td>Smoking/</td>
<td>128354</td>
</tr>
<tr>
<td>&quot;cigarette smoking&quot;.mp.</td>
<td>23783</td>
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<tr>
<td>smoker*.mp.</td>
<td>61694</td>
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<tr>
<td>1 or 2 or 3 or 4 or 5 or 6</td>
<td>184212</td>
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<tr>
<td>&quot;Diet/</td>
<td>62192</td>
</tr>
<tr>
<td>nutrition.mp.</td>
<td>164047</td>
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<tr>
<td>Energy Intake/</td>
<td>34148</td>
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<tr>
<td>&quot;nutrient intake&quot;.mp.</td>
<td>4701</td>
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<tr>
<td>&quot;food intake&quot;.mp. or Eating/</td>
<td>66595</td>
</tr>
<tr>
<td>&quot;dietary intake&quot;.mp.</td>
<td>15836</td>
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<tr>
<td>&quot;food consumption&quot;.mp.</td>
<td>9310</td>
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<tr>
<td>&quot;dietary adequacy&quot;.mp.</td>
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<td>&quot;dietary quality&quot;.mp.</td>
<td>649</td>
</tr>
<tr>
<td>&quot;diet index&quot;.mp.</td>
<td>42</td>
</tr>
<tr>
<td>&quot;dietary habit&quot;.mp.</td>
<td>265</td>
</tr>
<tr>
<td>&quot;dietary pattern&quot;.mp.</td>
<td>1815</td>
</tr>
<tr>
<td>&quot;dietary behaviour&quot;.mp.</td>
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</tr>
<tr>
<td>8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20</td>
<td>301968</td>
</tr>
<tr>
<td>7 and 21</td>
<td>5744</td>
</tr>
<tr>
<td>limit 22 to (english language and humans and &quot;all adult (19 plus years&quot;)</td>
<td>4034</td>
</tr>
</tbody>
</table>

**Brainstorm**

- Take your ideas to see the Faculty Librarian, Debbie Booth, to refine your search
4. Conduct your search

libguides.newcastle.edu.au/sysreviews
4. Conduct your search

**Databases**

- No one database (not even Google) will index all scholarly literature!
- Each database will index a defined set of publications
- There is overlap between databases
- Each database may use a different subject heading to describe a subject
  PubMed and Medline (plus Medline in Process) include basically the same records

**Quick Search Guide to Health Databases**
4. Conduct your search

Your search strategy

• Don’t reinvent the wheel - use pre-tested strategies and filters!
  − check search strategies in published reviews. Cochrane and JBI reviews in particular include search strategies used for each database
  − check Search Filter sites (Systematic Review LibGuide > Search Strategies page)

• Perfect your search strategy in one database before translating to others
  − Medline is recommended as the test database

• Check the results
  − are articles already identified as relevant picked up by the search (if not, why not?)
  − check records for subject headings, keywords and words used in abstract. Are there any that can be added to the search strategy?

• Peer review the strategy
  − colleague, supervisor or Faculty Librarian
  − use the Checklist for Reviewing Search Strategies (on Systematic Review LibGuide)
4. Conduct your search

Converting your search strategy to other databases

• Subject headings used in each database can be different:
  – E.g. physical activity – “motor activity” (MEDLINE), “physical activity” (EMBASE and CINAHL)
  – E.g. pressure sore – “pressure ulcer” (MEDLINE and CINAHL), decubitus (EMBASE)

• Syntax may vary:
  – E.g. adjacency searching – OVID uses `adj`, CINAHL uses `n`, COCHRANE uses `NEXT`

• Limits may vary:
  – E.g. adult in MEDLINE is 18+, in EMBASE is 19+
  – E.g. MEDLINE includes a “Young Adult” (18-24) limit, EMBASE and CINAHL don’t include this limit

• Phrase searching:
  – Ensure you use double quotation marks in PubMed and Scopus for phrases
  – E.g. searching PubMed: `heart attack` – 217,791 / “heart attack” – 3,539
4. Conduct your search

Keeping up to date

• Saved search alerts
  – save your draft and final searches within the database
  – these are saved permanently, can be re-run or modified
  – can also save an auto-alerts to be run daily/weekly/monthly, with matching records emailed, or
  – available via a RSS feed

• Table of contents alerts
  – for notification of new issues of key journals

• Citation alerts
  – for notification when an author, or specific article is cited
4. Conduct your search

EndNote

• All references to be imported into the one EndNote Library
  – Keep track of numbers pre- and post-deduplication

• Importing from databases
  – Each database platform will use a different method for importing references from the database into EndNote

• Duplicate checking – 2 step process
  – Run EndNote’s Find Duplicates command
  – Follow up with a manual scan

• Find Full Text command
  – Automatically locate and attach PDFs of journal articles subscribed

EndNote Tips for Systematic Reviewers
4. Conduct your search

**Covidence**

Elements of the systematic review that can be conducted via Covidence:

- citation importing and screening
- full-text review
- study selection
- quality assessment
- data extraction
- data exporting.

One free review, then subscription.

www.covidence.org
Before you get started

Start at the end!

- Know what the finished product needs to look like
- This is where the team becomes important
- Decide how you are going to manage your review
- How are you going to keep track of all your records between reviewers

Stop and plan ahead
5. Screening process

To retrieve or not retrieve...

Step 1. Title/Abstract screening:
- Record as Retrieve/Not Retrieve/Unsure
- Generally be "over-inclusive" at this stage
- Use Endnote and/or hardcopy print-outs
- Use 2 independent reviewers at this step and any disagreements are discussed or referred to a third reviewer.
- Test your protocol with your second reviewer and screen a proportion of your records and discuss to ensure you are on the same page
5. Screening process

Tips for EndNote

• All references are stored in Endnote
• Endnote has functions that can help to manage and code your references

• Group sets and groups:
  − To account for which databases the articles came from
  − Record who gets which articles as the second reviewer
  − Help code at each screening stage: R/NR/Unsure and I/E and reason for Exclude
Endnote: Creating Group Sets/Groups
5. Screening process

Tips for EndNote

- All references are stored in EndNote
- EndNote has functions that can help to manage and code your references
- Exporting titles/abstracts to word
  - Allows second reviewer to code without seeing first reviewers answers
  - Easier to take with you and “code on the go”
Endnote: Exporting to word
5. Screening process

Tips for EndNote

• All references are stored in Endnote
• Endnote has functions that can help to manage and code your references

• Changing display fields
  – Using Endnote to code answers by changing display fields
  – You can print the titles/abstracts and record answers on paper and then transcribe to Endnote
  – Ensure that your answers remain independent regardless of your method
Endnote: Coding and changing fields
5. Screening process

Tips for EndNote

• All references are stored in EndNote
• Endnote has functions that can help to manage and code your references
• Comparing first and second reviewer decisions
  – Remember you cannot see each others decisions while undertaking this screening process
  – This video assumes the second reviewer used paper copy to make decisions and you are now converting their answers into your EndNote file
Endnote: Comparing first and second reviewer
5. Screening process

Finding full text

Step 2. Retrieve/Find full text for Retrieve and Unsure

- You may find multiple reports of the same study, link together
- Use EndNote function to find full text and then manually search via UON library catalogue and attach to EndNote
5. Screening process

To include or not to include...

Step 3. Full text screening

• Record as Include/Exclude

• For the records that are Excluded you also need to record the reason why (based on PICOS statement)
  – Participant
  – Intervention
  – Comparator
  – Outcome
  – Study type

• Use 2 independent reviewers at this step and any disagreements are discussed or referred to a third reviewer.
5. Screening process

Tips for EndNote

• All references are stored in Endnote
• Endnote has functions that can help to manage and code your references
• Coding for Include/Exclude step
  – Majority of the steps are repeated from Title/Abstract screening
  – Again you must compare to second reviewer
Endnote: Coding for Include/Exclude
5. Screening process

Inter-rater agreement (Cohen’s kappa test)

• Compares the inter-rater agreement between the first and second reviewer.

• Complete for both screening processes
  – Title/Abstract (R/NR)
  – Full text (I/E)

\[
\kappa = \frac{p_o - p_e}{1 - p_e} = 1 - \frac{1 - p_o}{1 - p_e},
\]
Endnote: Preparing to export to excel
Exporting to excel

1. Open file
2. Select all
3. Copy
### Exporting to excel

#### Table of Data

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NR</td>
<td>S. Bradish 2012 Quality of life outcomes after third molar removal in subjects with minor symptoms of periodontitis</td>
</tr>
<tr>
<td>2</td>
<td>NR</td>
<td>R. F. Branci 1995 Effect of dietary components on hprl mutant frequencies in human T-lymphocytes</td>
</tr>
<tr>
<td>3</td>
<td>NR</td>
<td>D. Brandt 2006 Questionnaire evaluation and risk factor identification for nonallergic vasomotor rhinitis</td>
</tr>
<tr>
<td>4</td>
<td>NR</td>
<td>F. Fokate, 1987 Radiculopathy in asplaginal cancer surgery</td>
</tr>
<tr>
<td>5</td>
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<td>D. T. Felic 1983 Does smoking protect against osteoarthritis?</td>
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<td>H. N. Kell 1999 Activity limitation and food intake in community living seniors</td>
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<td>K. Marang 1998 Diet, antioxidant status, and smoking habits in French men</td>
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<td>8</td>
<td>NR</td>
<td>J. B. McI 2009 Immediate and short-term impact of a brief motivational smoking intervention using a biomedical risk assessment: The Get PHIT trial</td>
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<td>H. Schrot 2007 Relationship of abdominal obesity with alcohol consumption at population scale</td>
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<td>C. W. Thar 2007 Comparative whole-grain intake of British adults in 1986-7 and 2000-1</td>
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<td>11</td>
<td>NR</td>
<td>C. B. Thor 1968 Precursors of hypertension and coronary disease among healthy medical students: discriminant function analysis</td>
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<tr>
<td>12</td>
<td>R</td>
<td>J. E. Cala 1991 Relationship between diet and smoking - Is the diet of smokers different?</td>
</tr>
<tr>
<td>13</td>
<td>R</td>
<td>A. R. Dyer 2003 Dietary intake in male and female smokers, ex-smokers, and never smokers: The INTERMAP Study</td>
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<tr>
<td>14</td>
<td>R</td>
<td>R. M. Engl 1997 Dietary intake of Australian smokers and nonsmokers</td>
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<td>15</td>
<td>R</td>
<td>J. Woo, et al 2001 Dietary habit of smokers in a Chinese population</td>
</tr>
<tr>
<td>16</td>
<td>R</td>
<td>H. Emami, 2008 Knowledge regarding nutrition, attitude and practice of smokers and non-smokers</td>
</tr>
<tr>
<td>17</td>
<td>R</td>
<td>A. Morab 1999 Effects of smoking and smoking cessation on dietary habits of a Swiss urban population</td>
</tr>
<tr>
<td>18</td>
<td>R</td>
<td>A. Morab 1990 Dietary habits of smokers, people who never smoked, and exsmokers</td>
</tr>
<tr>
<td>19</td>
<td>R</td>
<td>R. Nylander, 1999 Dietary habits for non-smokers, females living with smokers or non-smokers</td>
</tr>
</tbody>
</table>
5. Screening process

Inter-rater agreement (Cohen's kappa test)
5. Screening process

Inter-rater agreement (Cohen’s kappa test)

http://graphpad.com/quickcalcs/kappa1/

<table>
<thead>
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<th>A</th>
<th>B</th>
<th>Total</th>
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<tr>
<td>Total</td>
<td>10</td>
<td>9</td>
<td>19</td>
</tr>
</tbody>
</table>

Number of observed agreements: 16 (84.21% of the observations)
Number of agreements expected by chance: 9.5 (49.86% of the observations)

Kappa = 0.685
SE of kappa = 0.166
95% confidence interval: 0.360 to 1.000
The strength of agreement is considered to be 'good'.

The calculator was updated in July 2014 so it doesn't try to compute the SE or CI when Kappa = 0.0.

This calculator was changed in April 2011 to use a better equation for computing the SE and confidence interval of Kappa. It now uses equations 18.16 to 18.20 from Fleiss, *Statistical Methods for Rates & Proportions (3rd edition)*. It did not work between Aug. 1 and Sept 7, 2012.
5. Screening process

Managing references

- Use bibliographic software (e.g. EndNote)
- Record study inclusion / exclusion in the software

149 articles from search strategy

77 excluded as did not meet inclusion criteria for:
  - Participants (n=57)
  - Study design (n=34)
  - Outcomes (n=53)
  - Intervention (n=61)

72 articles retrieved

32 additional found from reference list search

19 excluded as did not meet inclusion criteria for:
  - Participants (n=16)
  - Outcomes (n=17)
  - Study design (n=12)
  - Intervention (n=12)

13 articles retrieved

50 excluded as did not meet inclusion criteria for:
  - Participants (n=41)
  - Study design (n=12)
  - Outcomes (n=25)
  - Intervention (n=10)

20 included articles = 18 separate studies
  3 ongoing studies
6. Data extraction

What data needs to be extracted?

This varies according to your research question, and will relate to the protocol that you are following. For example, Cochrane reviews require as a minimum:

**Source data:** e.g. citation and contact details

**Eligibility:** Confirmed eligibility or reason for exclusion

**Methods:** e.g. Study design, study duration, study methodology relating to bias

**Participants:** e.g. number, setting, age, sex, diagnostic criteria, country

6. Data extraction

What data needs to be extracted?

**Intervention:** e.g. number of groups, specific intervention for each (giving enough detail for replication)

**Outcomes:** e.g. measurement time points, outcome definition, units of measurements

**Results:** e.g. number of participants in each intervention group, sample size, missing participants, summary data

**Miscellaneous:** Funding source/s, authors conclusions, references to other relevant studies

6. Data extraction

Two reviewers extract the data

Why:
- Data is not always found in consistent places in articles
- It can be easy to miss or misinterpret information

Before data extraction occurs:
- Decide on the level of detail that needs to be extracted
- Develop and / or trial a data extraction tool: paper or electronic?
6. Data extraction

What data extraction tools are available?

- Cochrane
- Joanna Briggs Institute
- Within systematic reviews in your field
- Develop your own according to need

Sourced from:
https://cfgd.cochrane.org/sites/cfgd.cochrane.org/files/uploads/Study%20selection%20%26%20extraction%20form%20RM5.doc

http://joannabriggs.org/assets/docs/jbc/operations/dataExtractionForms/JBC_Form_DataExtractionForms.pdf

### 6. Data extraction

#### Paper-based extraction forms

<table>
<thead>
<tr>
<th>Study Reference:</th>
<th>Milkeson 2016 - Coconut oil + rating health</th>
</tr>
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<td>Study ID:</td>
<td>Mil2016_3849</td>
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<tr>
<td>Data Extractor:</td>
<td>Jenny</td>
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<tr>
<td>Data extracted</td>
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<tr>
<td>Possible responses</td>
<td></td>
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<tr>
<td>Has the trial been randomised?</td>
<td>Yes / No / Unclear / Not reported</td>
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<tr>
<td>Does the sample include people with diabetes?</td>
<td>Yes / No / Unclear / Not reported</td>
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<tr>
<td>Sample size</td>
<td>Ctrnl: 69</td>
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<tr>
<td></td>
<td>Int: 57</td>
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<tr>
<td>Intervention content</td>
<td>Ctrnl: usual care</td>
</tr>
<tr>
<td></td>
<td>Int: 60g BID organic cold pressed virgin</td>
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</table>

Comments about manuscript:
6. Data extraction

Electronic extraction forms

<table>
<thead>
<tr>
<th>Study Reference</th>
<th>Study ID</th>
<th>Data extractor</th>
<th>Has the trial been randomised?</th>
<th>Does the sample include people with diabetes?</th>
<th>Sample size</th>
<th>Intervention content</th>
<th>Comment about manuscript</th>
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</tbody>
</table>
6. Data Extraction

Trial your extraction form and populate dummy tables

Trial your data extraction form to ensure you have all the information required for your topic

7. Study quality

All included studies should be assessed for quality/risk of bias

- Standardised critical appraisal tools are available (include as appendix to protocol)
- **Read the instructions carefully** if using a pre-existing tool to ensure it is used correctly
- Two reviewers complete this step
- Extract the study quality data using the same process data extraction
- Record the agreement level between reviewers as this is likely to be required for most journals publishing systematic reviews
- You may decide to remove studies from the review with low quality/high risk of bias
7. Study quality

For example...

Papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved with a third reviewer.

Due to low number of expected included studies, no studies will be excluded based on methodological quality. However the quality will be taken into consideration when determining whether meta-analysis is appropriate and in drawing conclusions from pooled results.
7. Study quality

Example tools to assess study quality – differ by focus and study type

• Joanna Briggs Institute

• Best Evidence Topics
  http://www.bestbets.org/links/BET-CA-worksheets.php

• American Dietetic Association
  http://www.andeal.org/evidence-analysis-manual

• AMSTAR summary of existing tools
  http://amstar.ca/Existing_Critical_Appraisal_Tools.php

• Duke University
  http://guides.mclibrary.duke.edu/c.php?g=158155&p=1035796

• Plus many, many more.
7. Study quality

Interpreting the results

• What, if any, are the sources of bias?
• What impact do they have on the results?

<table>
<thead>
<tr>
<th>Risk of bias</th>
<th>Interpretation</th>
<th>Across studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk of bias.</td>
<td>plausible bias unlikely to seriously alter the results.</td>
<td>Most information is from studies at low risk of bias.</td>
</tr>
<tr>
<td>Unclear risk of bias.</td>
<td>plausible bias that raises some doubt about the results.</td>
<td>Most information is from studies at low or unclear risk of bias.</td>
</tr>
<tr>
<td>High risk of bias.</td>
<td>plausible bias that seriously weakens confidence in the results.</td>
<td>The proportion of information from studies at high risk of bias is sufficient to affect the interpretation of results.</td>
</tr>
</tbody>
</table>
8. Data Synthesis

Collate your data according to your objective

- The comparisons between the outcome results are the “effect”.
- The data synthesis aims to answer 4 questions:
  1. What is the direction of effect?
  2. What is the size of effect?
  3. Is the effect consistent across studies?
  4. What is the strength of evidence for the effect?
8. Data Synthesis

**Narrative or quantitative?**

- Analyses may be **narrative** or **quantitative**
- **Narrative:** structured summary and discussion of the studies’ characteristics and findings
- **Quantitative:** involves statistical analysis (e.g. meta-analysis).
- Both still aim to answer the 4 questions
- Be guided by the format you are using for the most appropriate way to synthesis the data. E.g.: Cochrane, JBI
9. Draft your review

**Collate the results of your work**

- Stick to your protocol and reference it if you have published it
- Check the journal requirements for systematic review to ensure you meet their guidelines
- Use the PRISMA guidelines
- Populate your flow chart, again using the PRISMA guidelines
- Good luck!
Question time?