Management/Analysis Tools for Reviews

- James Thomas, EPPI-Centre
- Ethan Balk, Brown University
- Nancy Owens, Covidence
- Martin Morris, McGill Library

KTDRR and Campbell Collaboration Research Evidence Training Session 3: April 17, 2019
Agenda

3:00 – 3:05: Introduction

3:05 – 3:25: EPPI-Reviewer, James Thomas

3:25 – 3:45: Abstrackr, Ethan Balk

3:45 – 4:05: Covidence, Nancy Owens

4:05 – 4:25: Rayyan, Martin Morris

4:25 – 4:30: Wrap-up, Evaluation
A brief introduction to EPPI-Reviewer

James Thomas
KTDRR and Campbell Collaboration Research Evidence Training: Management/Analysis Tools for Reviews
April 17 2019

James Thomas – james.thomas@ucl.ac.uk
Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre)
Social Science Research Unit
UCL Institute of Education
University College London
Outline

• A very brief history of EPPI-Reviewer
• The design principles of EPPI-Reviewer
• Outline of the structure of EPPI-Reviewer
• Overview of functionality
• The future
## History – key dates

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>The ‘EPIC’ database was created</td>
</tr>
<tr>
<td>1995</td>
<td>The EPI-Centre was founded and EPIC became a multi-user database</td>
</tr>
<tr>
<td>2000</td>
<td>The EPPI-Centre was renamed and EPPI-Reviewer was published as a web-based systematic review platform</td>
</tr>
<tr>
<td>2008</td>
<td>EPPI-Reviewer version 4 was launched featuring new (at the time!) machine learning / text mining technologies</td>
</tr>
<tr>
<td>2015</td>
<td>Became one of Cochrane’s ‘author support tools’, in particular to support more complex reviews</td>
</tr>
<tr>
<td>2018</td>
<td>EPPI-Reviewer version 5 launched internally at NICE</td>
</tr>
<tr>
<td>2018</td>
<td>Campbell Collaboration mapping visualisation launched</td>
</tr>
<tr>
<td>2019</td>
<td>EPPI-Reviewer-Web launched (name yet to be finalised) for all users</td>
</tr>
</tbody>
</table>
Design principles

- **Flexibility**: supports a wide range of review / study types and uses
  - Development driven by user need
  - Does not assume one specific workflow
  - Full support for ‘mapping’ research activity
- **Completeness**: enables reviewers to conduct their entire review in the same tool
- **Analytical**: supports a range of types of analysis
- **Currency**: is up to date in terms of review methods and technology
- **Scale-ability**: tools to manage reviews with large numbers of studies
- **Not for profit**: we have to cover some costs, but any surplus is invested in new development
Three flavours of EPPI-Reviewer

• EPPI-Reviewer 4
  – Most complete in terms of functionality
  – Requires the Silverlight browser plugin
  – Does not work on mobile devices

• EPPI-Reviewer 5
  – Designed to support NICE reviews
  – Not available outside NICE

• EPPI-Reviewer-Web
  – Accesses the same database as EPPI-Reviewer 4
  – Works in all modern web browsers (including mobile)
  – Currently a subset of EPPI-Reviewer 4 features, but will soon support everything its older cousin does
EPPI-Reviewer: connected services

- Both EPPI-Reviewer 4 and Web
  - Use the same portal for account and user management
  - Access the same database
- EPPI-Reviewer 4, 5 and Web
  - Use the same machine learning services
- R is used for backend statistical analysis
- Microsoft Azure Machine Learning platform
- Campbell Collaboration mapping software
EPPI-Reviewer architectural design

Central (Azure) data stores and services

Open Access Data Sources
- e.g. PubMed
- Mendeley
- CrossRef

Automatic (and semi-automatic) download of full text documents of studies (HTML, XML, DOC...)

Review Tools and Ontologies
- e.g. commonly used risk of bias tools
- HBCP / PICO ontology

Machine Learning Classifiers:
- Classifiers for specific types of study (RCT etc.);
- Specific classifiers that 'learn' a given review topic / domain

Authentication Service (oAuth2)

Guideline Development (e.g. MAGICApp)

Evidence Mapping service and visualisations

Human Behaviour Change Project web portal

Mega-meta-analysis in education

Cochrane Services (CRSD / RevMan, Crowd...)

R Statistical Backend Services

Prediction and recommendation algorithms

Extraction of structured data from tables in PDF files

Machine learning and information extraction
EPPI-Reviewer architectural design

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EPPI-Reviewer:
- software for annotation, curation and evidence synthesis

EPPI-Reviewer 5
- Deployed at National Institute for Health & Care Excellence (NICE)

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Extraction of structured data from tables in PDF files
<table>
<thead>
<tr>
<th>Feature Matrix</th>
<th>EPPI-Reviewer 4</th>
<th>EPPI-Reviewer 5</th>
<th>EPPI-Reviewer Web</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MULTIUSER FUNCTIONALITY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-user coding</td>
<td>✓</td>
<td>✓ (excl. data extraction)</td>
<td>✓</td>
</tr>
<tr>
<td>Discrepancy reports / coding reconciliation</td>
<td>✓</td>
<td>✓ (excl. data extraction)</td>
<td>*</td>
</tr>
<tr>
<td>Assign screening / data extraction to reviewers</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>CHECKING FOR DUPLICATES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run duplicate check</td>
<td>✓</td>
<td>✓</td>
<td>*</td>
</tr>
<tr>
<td>Manually check possible duplicates</td>
<td>✓</td>
<td>✓</td>
<td>*</td>
</tr>
<tr>
<td><strong>FULL DOCUMENT MANAGEMENT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upload PDF files</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>View PDF files within the program</td>
<td>✓</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td><strong>CODING TOOL MANAGEMENT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create / edit coding / data extraction risk of bias tools</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Select coding tool from list of generic cross-review tools</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Share coding tools across an individuals reviews</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Share coding tools across an organisation</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>APPLYING CLASSIFICATIONS TO ITEMS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Screening / eligibility assessment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Term highlighting</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Edit terms for highlighting</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Priority screening using machine learning</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Risk of bias assessment</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Data extraction</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Extraction of numeric outcome data</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Bulk assignment / removal of codes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Line by line selecting / coding text from PDF files</td>
<td>✓</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MACHINE LEARNING TOOLS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic ‘clustering’ of studies using machine learning</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Machine learning classifiers for study types</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>‘Build your own’ machine learning classifier</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
## SEARCHING, REPORTING AND ANALYSIS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Yes</th>
<th>No</th>
<th>Pending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive search with search history / combine searches</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Search / filter list of items</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency and crosstab reports</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual coding reports</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configurable ‘question’ reports</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meta-analysis</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meta-regression / subgroup analysis</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network meta-analysis</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRADE assessment</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic PRISMA diagrams</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Coding Progress

<table>
<thead>
<tr>
<th>Review Item</th>
<th>Included</th>
<th>Excluded</th>
<th>Deleted</th>
<th>Duplicates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training Set</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Work Allocation</strong></td>
<td>2398</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Duplicate?</strong></td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A1: Found in MAG after manual check?</strong></td>
<td>84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B1: Found in PubMed after manual check?</strong></td>
<td>84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C0-15: Factors that could explain why a Reg record is 'not found' in MAG</strong></td>
<td>72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D1-3: Factors that explain why a Reg record is 'hard to find' in MAG</strong></td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Your account expires on: 6/3/2020
Current(shared) review expires on 12/31/2020.

Create Review

Site Admin... Latest feedback: 3/6/2019
The Review home page gives you a summary of what is happening in your review and gives you access to many of the program's functions.

On the left is an up-to-date summary of the coding that has taken place for each coding tool.

In the middle are the My Reviews, My Work and Sources buttons giving you access to your reviews, coding assignments and sources.

On the right of the screen is the Codes button. Click on this button to show/hide your coding tools.

Your account expires on: 6/3/2020
Current (shared) review expires on 12/31/2020.
Import Coding Tools

This screen allows you to select individual Coding Tool(s) to import into your review. You can select a Coding Tool from the list below and see it displayed in the centre column. The Coding Tools that are already in your review are displayed in the third column.

Available Coding Tools (public)
- Screen on Title & Abstract
- Screen on Full Text
- Retrieval status
- Allocations

Risk Of Bias (Cochrane)

- Data extraction (Home Office review guidelines)
- Screening
- Allocations and Admin

Coding Tool Preview:
- Risk Of Bias (Cochrane)
  - Selection bias
    - Random sequence generation
    - Allocation concealment
    - Low risk
    - High risk
    - Unclear
  - Performance bias
  - Detection bias
  - Attrition bias
  - Reporting bias
  - Other bias

- Population
- Intervention
- Modes of Delivery
- Setting
- Source
- Reach
- Supplementary information
- Outcome (behaviour)
- Outcome (behaviour) value
- Effect
- OLD CODESET Population (Sprint 2)
- OLD CODESET (Target Behaviour) (Sprint 1)
- OLD CODESET (Context) (Sprint 1)
- OLD CODESET Setting (Sprint 2)
- OLD Population - non armrified
- Collaborative Coding
- Arms
<table>
<thead>
<tr>
<th>Item</th>
<th>1. Goals and planning</th>
<th>3. Social support</th>
</tr>
</thead>
</table>
| Abrantes (2014) (ID:28856292) | 1.2 Problem solving
Four sessions were conducted prior to quit day (weeks 1–4) and focused on identifying high-risk situations and developing behavioral and cognitive strategies for coping with high-risk situations.
 Abrantes 2014.pdf: Page 4: “identifying high-risk situations and developing behavioral and cognitive strategies for coping w” | -3.1 Social support (unspecified)
Treatment was delivered in 8, 20-min weekly telephone counseling sessions beginning in week 1 of the intervention.
Smokers who lapsed during treatment were encouraged to set a new quit date and continue to attempt to quit.
 Abrantes 2014.pdf: Page 4: “set a new quit date” | -3.1 Social support (unspecified) [X-Pack]
These steps involved (a) increasing positive outcome expectations associated with quitting, (b) enlisting a QuitPal, a friend for social support, (c) setting a quit date, (d) developing the skills for overcoming cravings, and (e) quitting and preventing relapse. ++
 Abroms 2008.pdf: Page 3: “encouraging the participant to set a quit date” |
The goal of the in-person counseling session, which took place in public spaces around the college campus, was to introduce the participant to the X-Pack kit, review key information related to smoking cessation presented in the kit, and to encourage the participant to set a quit date in the next month. ++ These steps involved (a) increasing positive outcome expectations associated with quitting, (b) enlisting a QuitPal, a friend for social support, (c) setting a quit date, (d) developing the skills for overcoming cravings, and (e) quitting and preventing relapse. ++
 Abrons 2008.pdf: Page 3: “encouraging the participant to set a quit date” | -3.1 Social support (unspecified) [Clearing the Air (CTA)]
Similar to the X-Pack Program, the goal of the in-person counseling session was to introduce the participant to the materials, go over key information related to smoking cessation as presented in the materials, and encourage the participant to set a quit date in the next month.
| Abrons (2014) (ID:28856293) | 1.2 Problem solving [X-Pack]
Participants who report that they have not quit are routed into a separate relapse message protocol, which includes the option of setting a new quit date. + “the option of setting a new quit date” +
 Abroms 2008.pdf: Page 4: “set a quit date in the next month” | -3.1 Social support (unspecified) [Text2Quit]
The text messages are timed around a user’s quit date and provide advice on quitting smoking. +
 Abroms 2014.pdf: Page 2: “provide advice” |
| Abrons (2014) (ID:28856293) | 1.2 Problem solving [Nicotine Gum + Health Education (HE)]
During HE sessions, trained counselors used the OKIS II Quit Smoking Guide® and semistructured scripts to review the addictive nature of nicotine, health consequences of smoking and benefits of quitting, and provided concrete strategies on developing a quit plan and identifying alter- natives against triggers to smoke.
 Abruvalia 2006 (c) primary paper.pdf: Page 4: “identifying alter- natives against triggers to smoke.” | -3.1 Social support (unspecified) |
| Abrons (2014) (ID:28856293) | 1.2 Problem solving [Text2Quit]
In general, participants received counseling from the same person for}
Q(df = 27) = 363.3374, p-val < .0001

Model Results:

<table>
<thead>
<tr>
<th>estimate</th>
<th>se</th>
<th>zval</th>
<th>pval</th>
<th>ci.lb</th>
<th>ci.ub</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.7940</td>
<td>0.0281</td>
<td>-28.2660</td>
<td>&lt;.0001</td>
<td>-0.8490</td>
<td>-0.7389</td>
</tr>
</tbody>
</table>

---

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Fit Statistics

ML
logLik:  -158.9269
deviance:  363.3374
AIC:  319.8539
BIC:  321.1861
AICc:  320.0077

Forest plot

NMA test

<table>
<thead>
<tr>
<th>Studies</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willms (1999)</td>
<td>-0.20 [-0.90, 0.50]</td>
</tr>
<tr>
<td>Hanefeld2004</td>
<td>0.16 [0.01, 0.33]</td>
</tr>
<tr>
<td>Yang (2003)</td>
<td>-0.14 [-0.58, 0.30]</td>
</tr>
<tr>
<td>Kim (2007)</td>
<td>0.00 [-0.46, 0.46]</td>
</tr>
<tr>
<td>DeFrancesco1995</td>
<td>-1.90 [-2.18, -1.62]</td>
</tr>
<tr>
<td>Lawin2007</td>
<td>-0.82 [-1.01, -0.63]</td>
</tr>
<tr>
<td>Davidson (2007)</td>
<td>-1.34 [-1.62, -1.06]</td>
</tr>
<tr>
<td>Wolfenbuehl1999</td>
<td>-1.10 [-1.32, -0.88]</td>
</tr>
<tr>
<td>Kipnes2001</td>
<td>-1.30 [-1.55, -1.05]</td>
</tr>
<tr>
<td>Keryny2004</td>
<td>-0.77 [-0.98, -0.56]</td>
</tr>
<tr>
<td>Baks2004</td>
<td>-1.30 [-1.50, -1.10]</td>
</tr>
<tr>
<td>Rossostock (2008)</td>
<td>-1.00 [-1.53, -0.65]</td>
</tr>
<tr>
<td>Zay (2003)</td>
<td>-1.50 [-1.82, -1.14]</td>
</tr>
</tbody>
</table>
Homelessness Effectiveness Map

This map shows the coverage of 206 impact evaluations and 21 systematic reviews.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Capabilities and Wellbeing</th>
<th>Cost</th>
<th>Crime and justice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Community engagement and social connectedness</td>
<td>Cost effectiveness</td>
<td>Arrest and imprisonment</td>
</tr>
<tr>
<td></td>
<td>Improved skill and self care</td>
<td>Cost per participant</td>
<td>Recidivism</td>
</tr>
<tr>
<td></td>
<td>Overall well being and quality of life</td>
<td>Saving</td>
<td>Victims of crime</td>
</tr>
<tr>
<td></td>
<td>Loneliness</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- High quality primary studies
- Low and medium primary studies
- Low and medium quality systematic review

Generated using v1.0.2 of the EPPI-Mapper powered by EPPI-Reviewer and created with love by the Digital Solution Foundry team.
The future…

• More (semi) automation –
  – Support for extraction of study characteristics
  – Extraction of data from tables / graphs
  – Automatic updates / ‘Living’ systematic reviews (key area of research & development)
  – More support for mapping (visualisations)
Any questions?

• Go to: https://eppi.ioe.ac.uk/ to find out more
Thank you

EPPI-Centre website: http://eppi.ioe.ac.uk
Email: j.thomas@ucl.ac.uk
Twitter: james_m_thomas

The EPPI-Centre is part of the Social Science Research Unit at the UCL Institute of Education, University College London
Thank you!

Please take a few minutes to respond to the brief Evaluation Survey:


- James Thomas: james.thomas@ucl.ac.uk
- Ethan Balk: ethan_balk@brown.edu
- Nancy Owens: nancy@covidence.org
- Martin Morris: martin.morris@mcgill.ca
The contents of this presentation were developed under grant number 90DPKT0001 from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this presentation do not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the Federal Government.