Cochrane Evidence Pipeline

8th World Conference on Research Integrity

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Research Integrity Editor, Cochrane

Trusted evidence.
Informed decisions.
Better health.

What is the Evidence Pipeline?

Cochrane is a **global independent network** of researchers, professionals, patients, carers, and people interested in health.

Cochrane contributors work together to produce credible, accessible health information that is **free from commercial sponsorship and other conflicts of interest**.
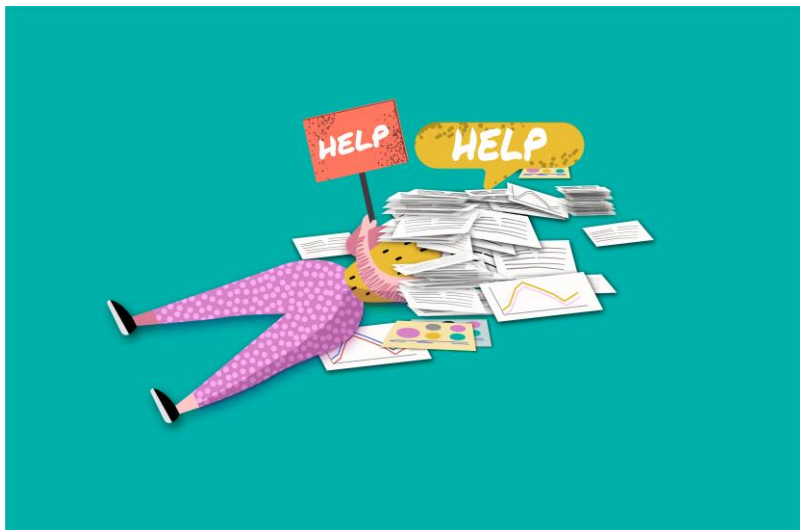
We gather and analyse the best available **evidence from RCTs** and other data to **produce systematic reviews** that help people make informed decisions about health and health care.

The **Evidence Pipeline** is a vital part of how we ensure that only the **best quality data** informs our reviews.

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Why build the Evidence Pipeline?

"Too much evidence" Greenhalgh 2014

Systematic reviewers **are struggling to keep pace** with the amount of 'evidence' produced

Global scientific output doubles every nine years, in part due to **skewed incentives**

Much of it is of dubious quality, e.g. data from **problematic studies and trials, paper mill** publications, etc.

Why build the Evidence Pipeline?

Much relevant data is unfindable and un-FAIR*

Siloed working and siloed data result in significant duplication of effort and **research waste**

***F**indable
Accessible
Interoperable
Reusable

Why build the Evidence Pipeline?

Effects on evidence synthesis process:

- Contributes to lengthy **"know-do" gaps** between research and implementation: evidence becomes out of date before it reaches patients

- Sifting through evidence places **significant burden** on review authors

- Research waste puts **strain on public funds**

- **Problematic/low quality data** gets included in systematic reviews and is then costly to remove
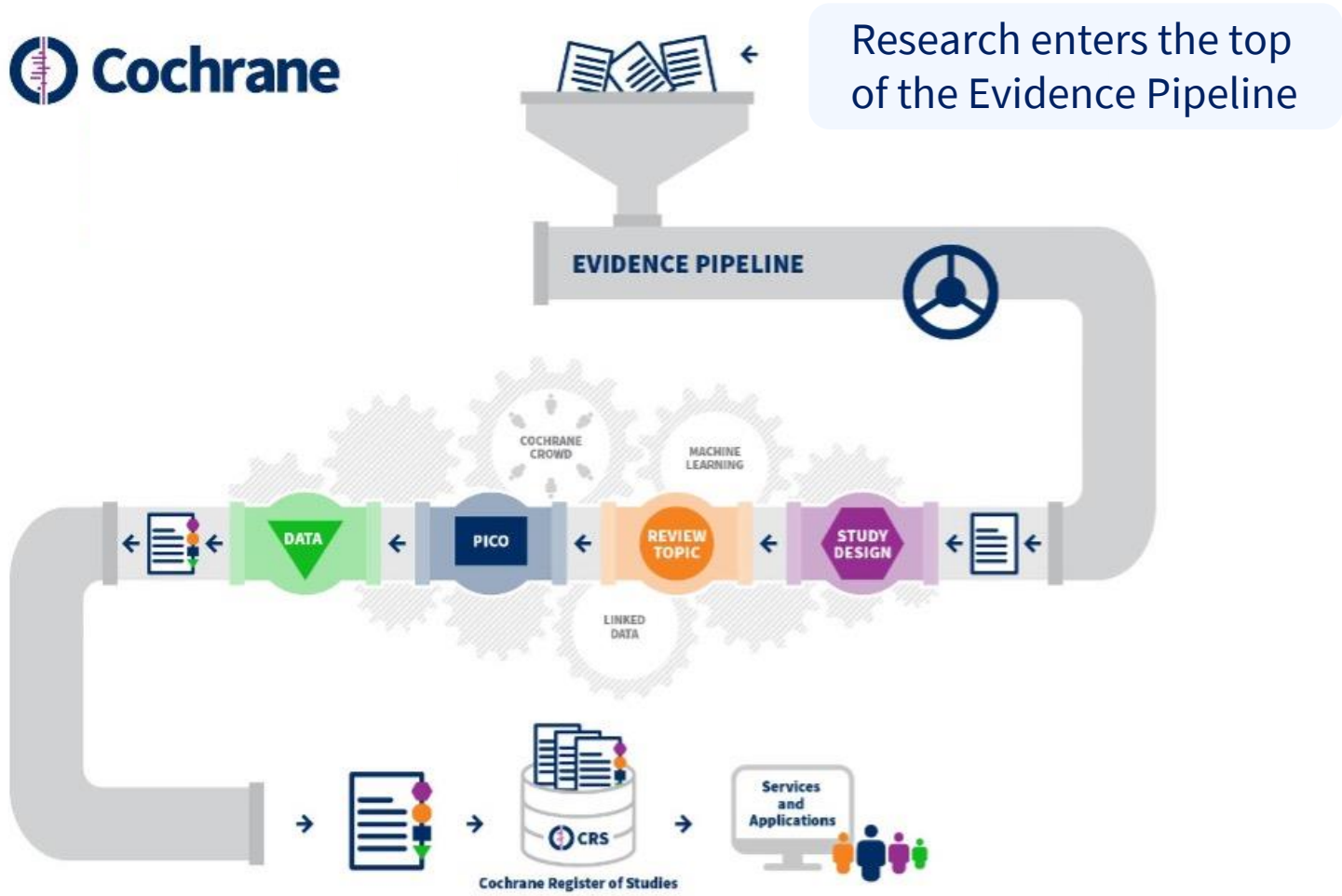
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Why build the Evidence Pipeline?

Aims to:

- **Improve discoverability** of high-quality primary research for review authors

- **Use research resources more responsibly** by lightening workload in 'the first third' of review production

- Better enable the reuse of data/metadata to **make data more FAIR**

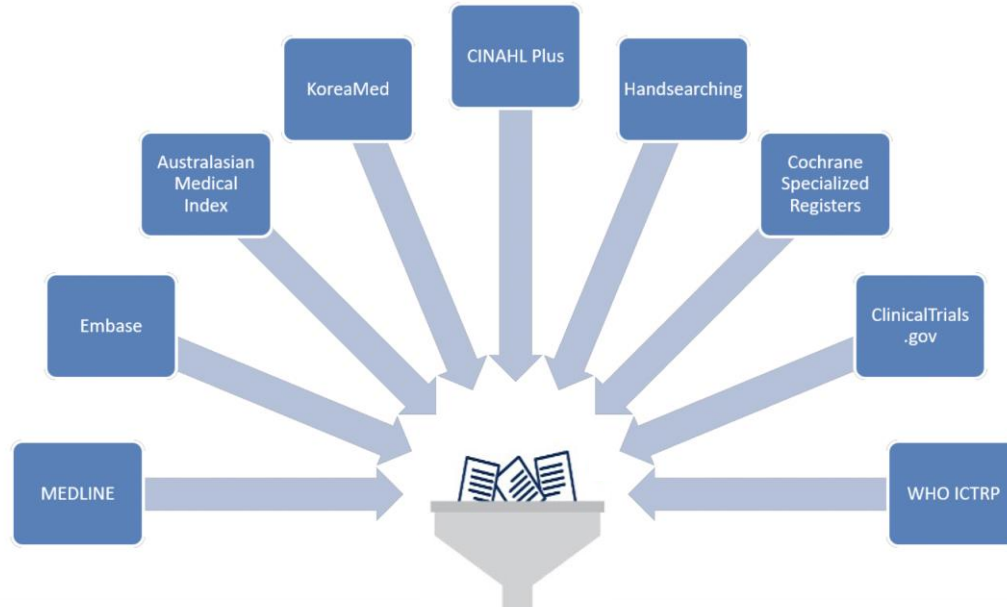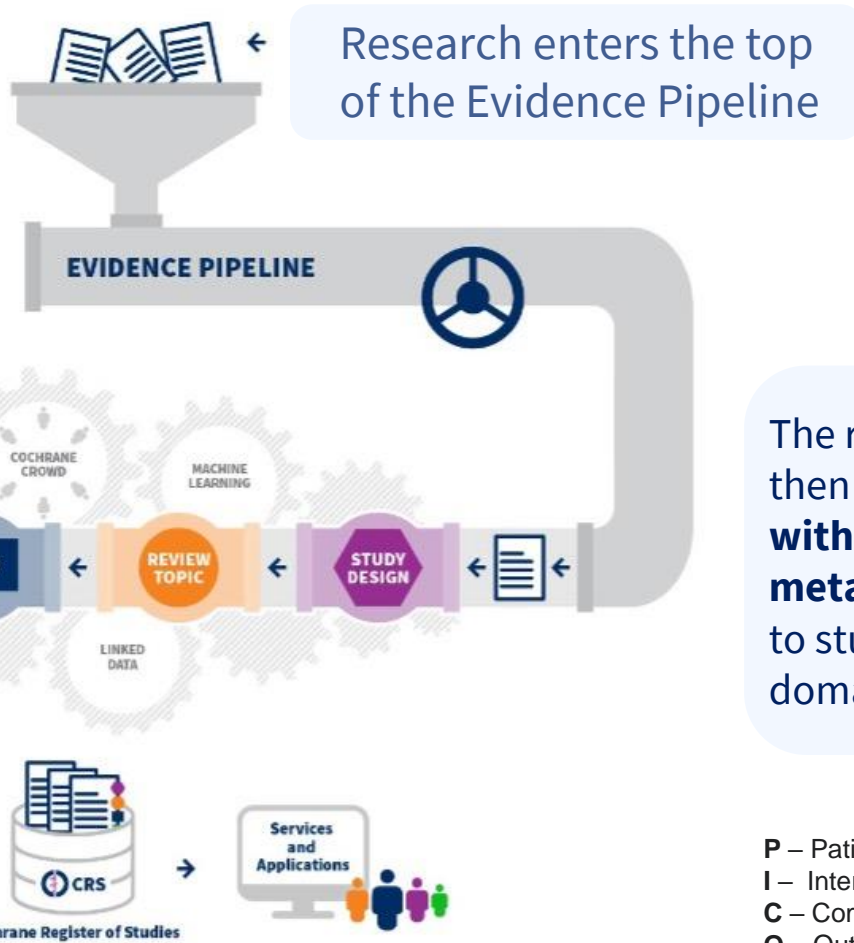- Build workflow solutions able to **spot and remove problematic data** before it becomes part of evidence synthesis
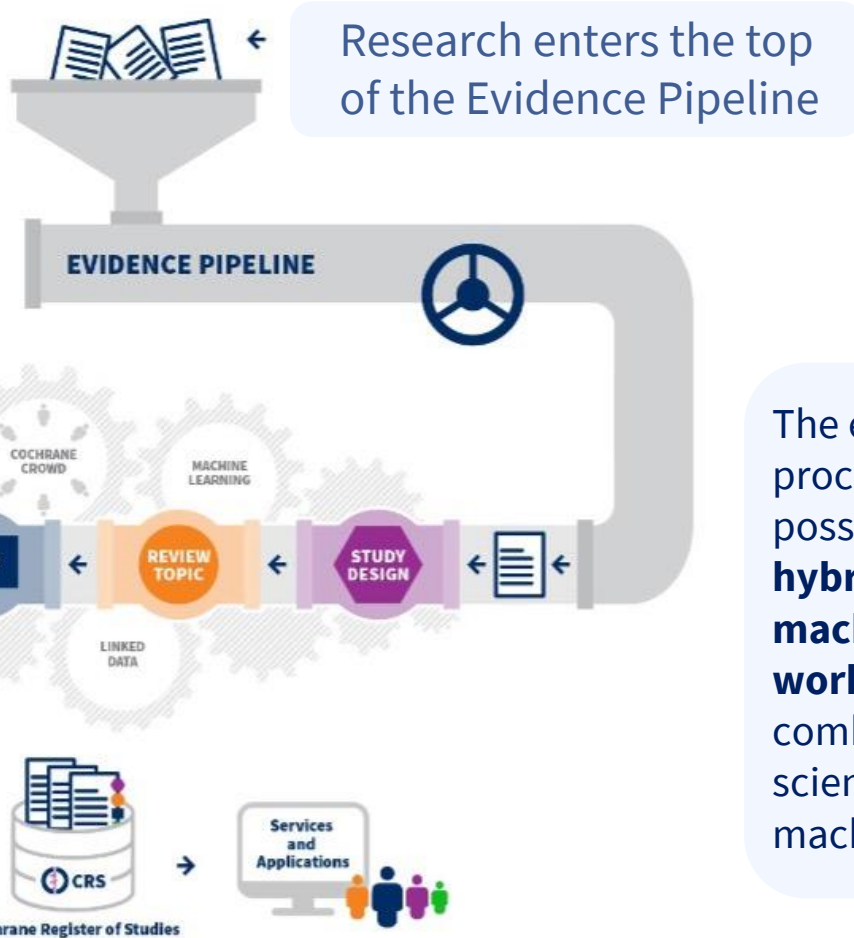
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EVIDENCE PIPELINE

COCHRANE CROWD

MACHINE LEARNING

LINKED DATA

DATA

PICO

REVIEW TOPIC

STUDY DESIGN

CRS

Cochrane Register of Studies

Services and Applications

Research enters the top of the Evidence Pipeline

Filling the Evidence Pipeline

Our software automatically searches multiple sources on a daily, weekly or monthly basis

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Research enters the top of the Evidence Pipeline

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Services and Applications

The records are then **enriched with high quality, metadata** related to study design, domain and PICO*

P – Patient, problem or population
I – Intervention
C – Comparison, control or comparator
O – Outcome(s)

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Research enters the top of the Evidence Pipeline

EVIDENCE PIPELINE

COCHRANE CROWD

MACHINE LEARNING

DATA → PICO → REVIEW TOPIC → STUDY DESIGN

LINKED DATA

CRS
Cochrane Register of Studies

Services and Applications

The enrichment process is made possible through **hybrid human-machine workflows** combining citizen science and machine learning

Cochrane Crowd

Distributed human intelligence tasking*
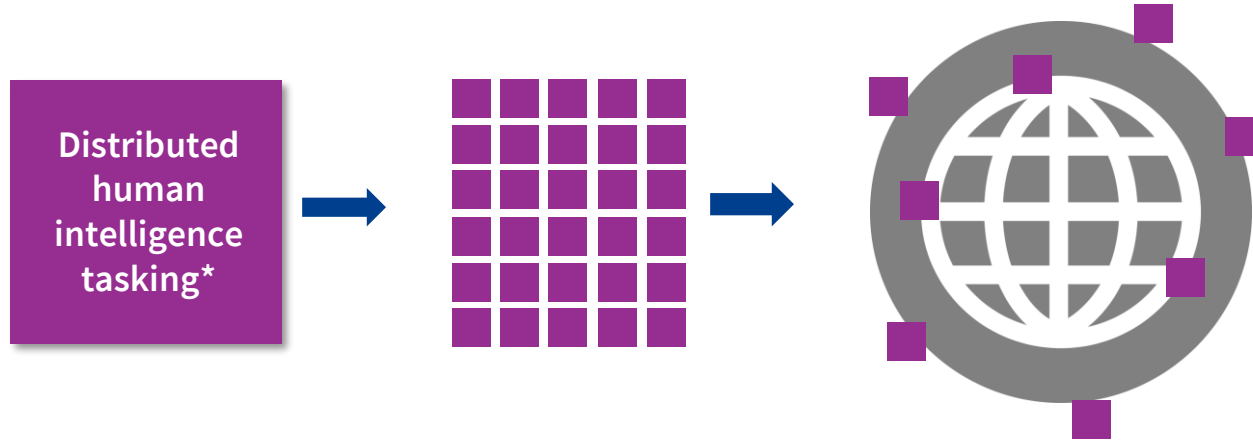
Breaking down a large corpus of data into smaller units and distributing those units to a large online crowd of citizen scientists

*"The distribution of small parts of a problem"

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Better health.

Dive in
Just want to get contributing as quickly as possible?
Start here
[Start]

Newcomers
Follow our structured Cochrane Crowd course aimed at those **new to health research**
[Start]

Student
Follow our structured Cochrane Crowd course aimed at **students and trainees**
[Start]

You can make a difference!

Become a Cochrane citizen scientist. Anyone can join our collaborative volunteer effort to help categorise and summarise healthcare evidence so that we can make better healthcare decisions.

[Give it a try]

Making better use of human effort.

Broaden the opportunities for wider involvement in the production of high quality evidence

https://crowd.cochrane.org

Robotic complete mesocolic excision with central vascular ligation for right colonic tumours - A propensity score-matching study comparing with standard laparoscopy

10.1093/bjsopen/zrab016

Background: Laparoscopic complete mesocolic excision (CME) of the right colon with central vascular ligation (CVL) is a technically demanding procedure. This study retrospectively evaluated the feasibility, safety and oncological outcomes of the procedure when performed using the da VinciVR robotic system. Methods: A prospective case series was collected over 3 years for patients with right colonic cancers treated by standardized robotic CME with CVL using the superior mesenteric vessels first approach. The CME group was compared to a 2 : 1 propensity score-matched non-CME group who had conventional laparoscopic right colectomy with D2 nodal dissection. Primary outcomes were total lymph node harvest and length of specimen. Secondary outcomes were operative time, postoperative complications, and disease-free and overall survival. Results: The study included 120 patients (40 in the CME group and 80 in the non-CME group). Lymph node yield was higher (29 versus 18, P=0.006), the specimen length longer (322 versus 260 mm, P=0.001) and median operative time was significantly longer (180 versus 130 min, P<0.001) with robotic CME versus laparoscopy, respectively. Duration of hospital stay was longer with robotic CME, although not significantly (median 6 versus 5 days, P=0.088). There were no significant differences in R0 resection rate, complications, readmission rates and local recurrence. A trend in survival benefit with robotic CME for disease-free (P=0.0581) and overall survival (P=0.0454) at 3 years was documented. Conclusion: Robotic CME with CVL is feasible and, although currently associated with a longer operation time, it provides good specimen quality, higher lymph node yield and acceptable morbidity, with a disease-free survival advantage.

Back   Next

RCT/qRCT

Reject
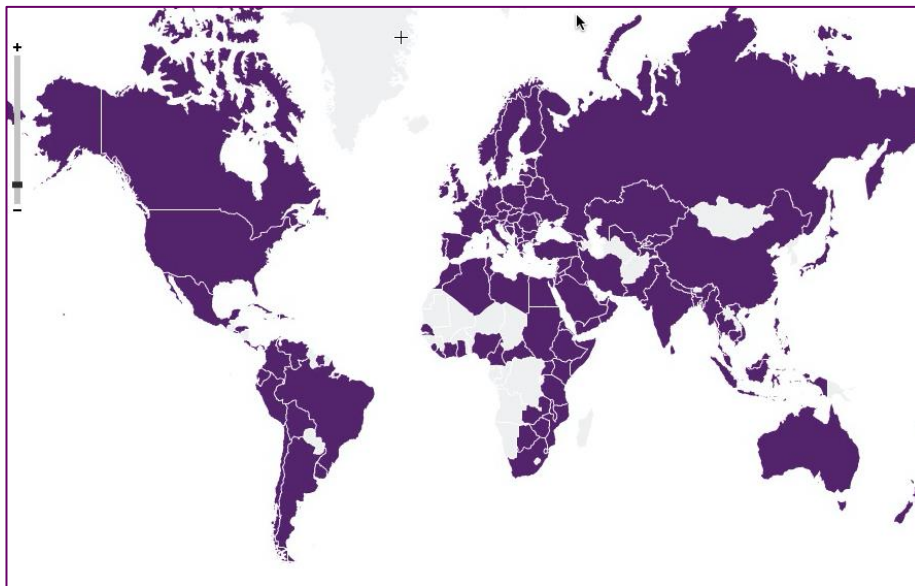
Unsure

☑ Move on with a single click

Help me decide

Add a note

Quick reference guide

RCT Identification

A "mainstream" task on Cochrane Crowd.
Our first task. Crowd have identified over 100,000 reports of RCTs. Records not indexed as RCT.

Crowd characteristics

- 46% educated to post-graduate level
- 19% don't have a degree
- 24% completely new to health research
- 33% had no or little idea of SRs
- 20% involved in review production
- 41% student in health-related area
- 32% aged 17-24 years

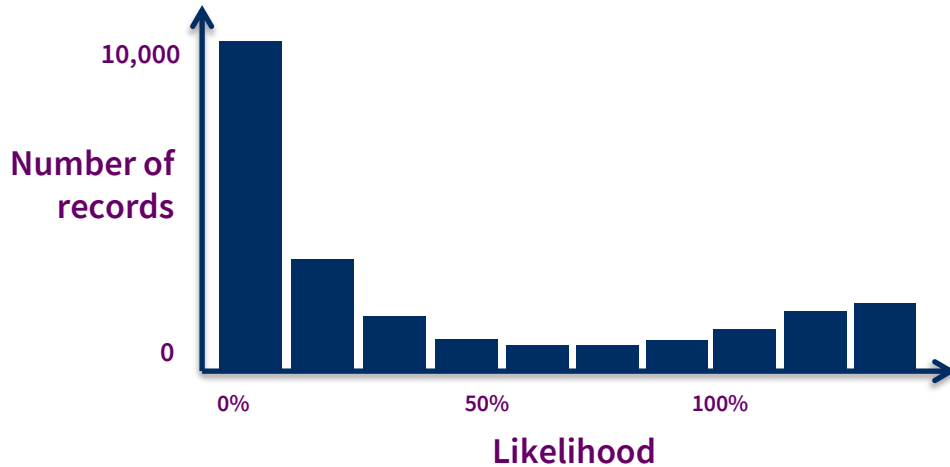We have more work to do to make Crowd more diverse and equitable!

Machine learning

Machine learning gives "computers the ability to learn without being explicitly programmed". In the context of Cochrane, this currently means building **classifiers ("RCT classifier") that provide likelihood scores** that a publication is a relevant RCT

Machine learning

All records identified from the centralised searches are given a likelihood score via a machine learning classifier (or model) that
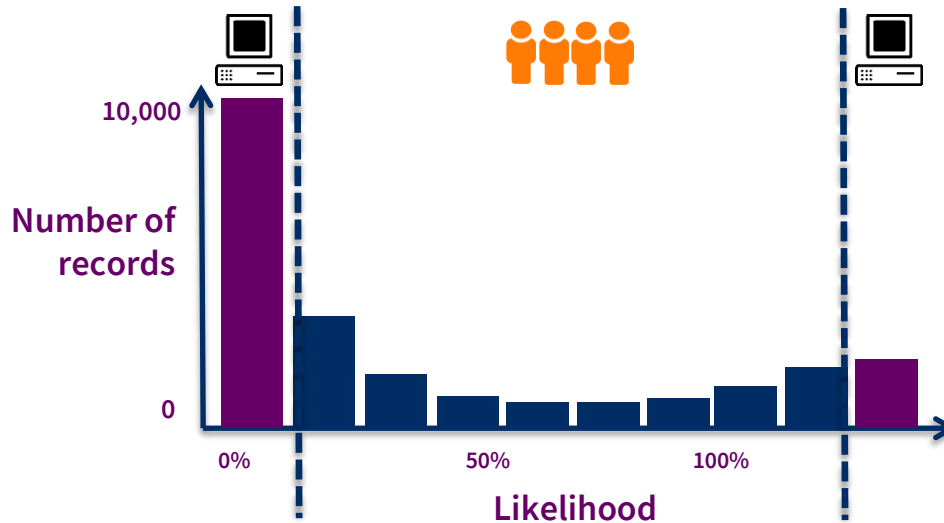
- was built and calibrated using high quality training data
- was validated on an independent dataset
- assigns scores to records that are probabilities of the record describing an RCT
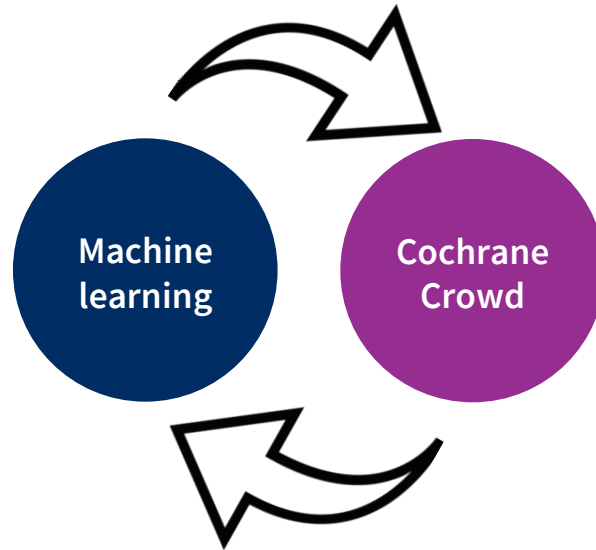- helps to weed out a significant proportion of non-RCT records
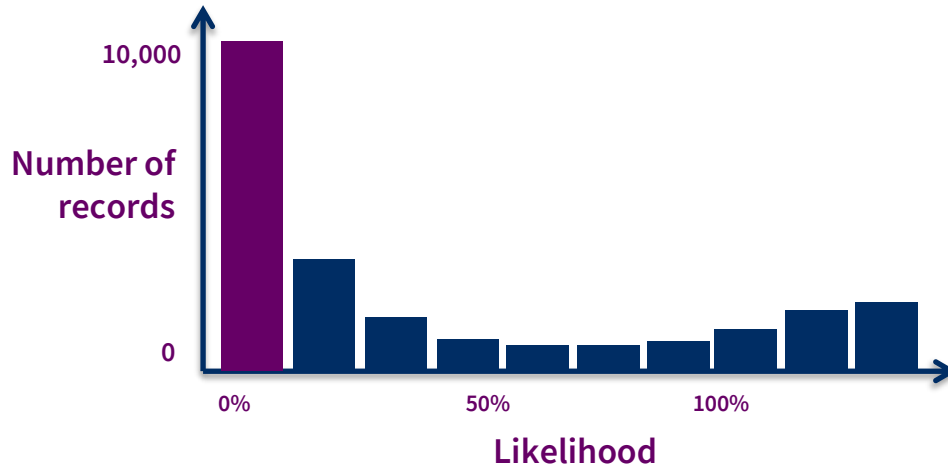
System efficiency: RCT classifier

As the classifier improves, the proportion of records that need to go to the Crowd will decrease

Virtuous circle

Machine learning

Cochrane Crowd

As the Crowd generates more data, it is fed to the machine who continues to learn and is in turn able to perform more and more of the task

Implementation

Two main modes of implementation:

- ***Creation of comprehensive repositories***

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Implementation

Two main modes of implementation:

- *Creation of comprehensive repositories*

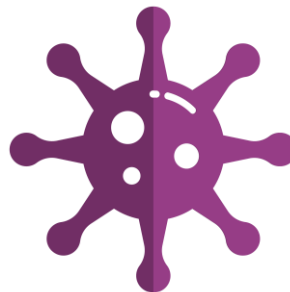 ➢ ***CENTRAL: Cochrane's Central Register of Controlled Trials***

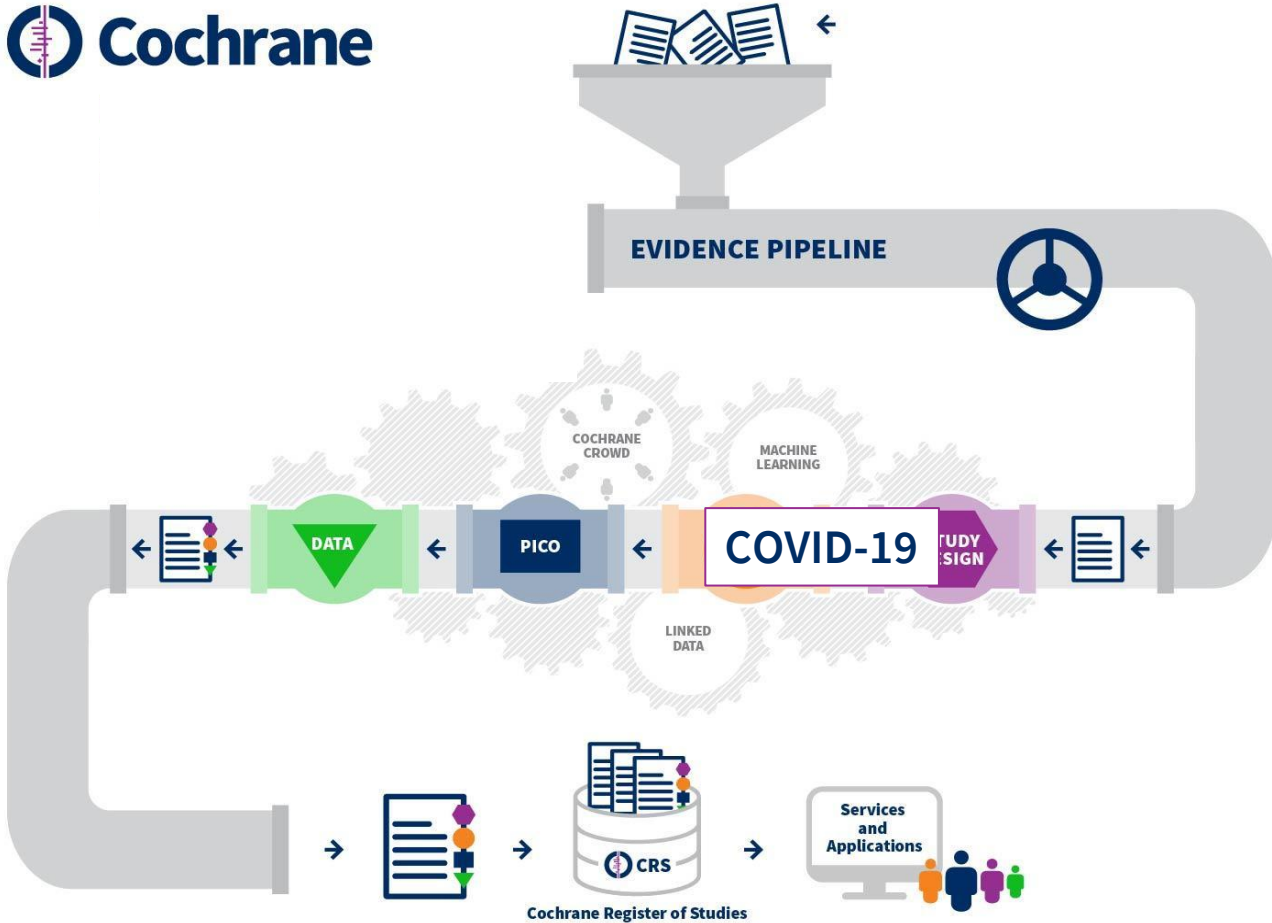**97.5% of RCTs included in Cochrane Reviews**

Implementation

Two main modes of implementation:

- Creation of comprehensive repositories
  - ➤ CENTRAL: Cochrane's Central Register of Controlled Trials
  - ➤ **Cochrane COVID-19 Study Register**

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COVID-19

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Services and Applications

-Built in 3 weeks
-Study based
-Enriched with machine/crowd metadata on study design and aims
-70% of process fully automated

Implementation

Two main modes of implementation:

- *Creation of comprehensive repositories*
  - ➢ *CENTRAL: Cochrane's Central Register of Controlled Trials*
  - ➢ *Cochrane COVID-19 Study Register*
- ***Review-level support for study identification***
  - ➢ *Screen4Me*

Impact

S4M

Screen4Me: Helping authors find RCTs relevant for specific reviews via a workflow that uses Crowd and machine learning

Impact

S4M

Screen4Me: Helping authors find RCTs relevant for specific reviews via a workflow that uses Crowd and machine learning

Over 200 reviews have used Screen4Me
Mean workload reduction in results screening: 72%

Trustworthiness

How can we be confident in the trustworthiness of the automated processes we have implemented?

1. Each component part has undergone robust evaluations and

2. They are implemented in a 'safe' way, with humans still very much 'in the loop'.

3. Records are triaged so as to simply reduce noise, allowing for the fact that some noise will still get through and need to be manually dealt with.

We prioritised recall over precision to ensure we don't lose relevant studies.

Next steps

Building on what we have, we want to:

Next steps

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- **Expand automation capability**
  - ➢ Implement new **'review-level' classifiers**
  - ➢ Improve **PICO automation**
  - ➢ More (community created) **classifiers**

Next steps
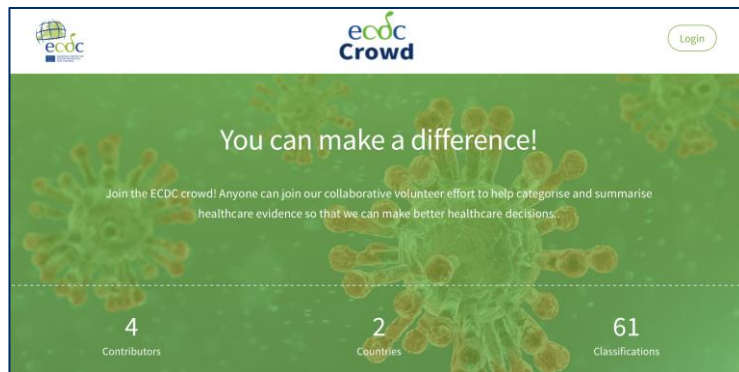
Building on what we have, we want to:

- *Expand automation capability*

- **Extend our ontology**

  ➢ *E.g. Mapping to sustainable development goals*

  ➢ *E.g. Beyond the RCT*

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Next steps

Building on what we have, we want to:

- *Expand automation capability*

- *Extend our ontology*

- **Enable access to tools, data, services beyond Cochrane**

  ➢ *Share tools e.g. Cochrane Crowd and classifiers*

  ➢ *Better sharing of data*

 ➢ *Better interoperability between tools*

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Next steps

Building on what we have, we want to:

- *Expand automation capability*

- *Extend our ontology*

- *Enable access to tools, data, services beyond Cochrane*

- **Develop more tasks on Cochrane Crowd that support research integrity**

  ➤ *helping to identify and investigate reports of retractions*

  ➤ *flagging suspicious data and publications (e.g. Paper Mill markers)*
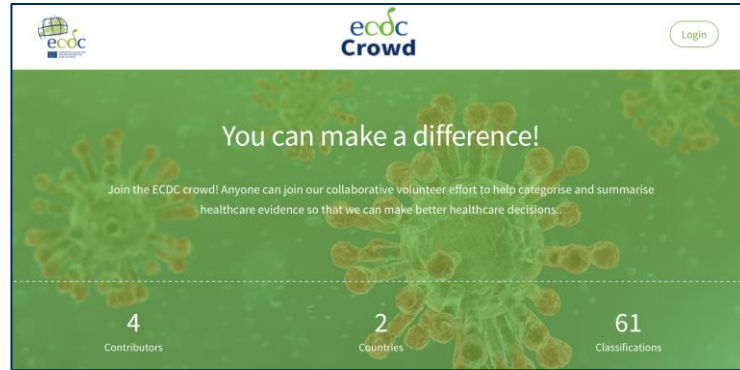
Summary

The Cochrane Evidence Pipeline uses machine , crowd and linked data technologies to:

- *Identify relevant evidence quicker to enable timely evidence synthesis*

- *Remove low-quality data produced due to various integrity issues in scientific publishing*

- *Reduce research waste*

- *Enable crowd-based integrity safeguards*

It provides an example of responsible AI use in evidence production in line with Cochrane's AI policy

Thank You!

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