Artificial Intelligence to Automate Evidence Surveillance: Application to the Epidemiological Parameter Pipeline

Epidemiological Parameter Technical Working Group Webinar

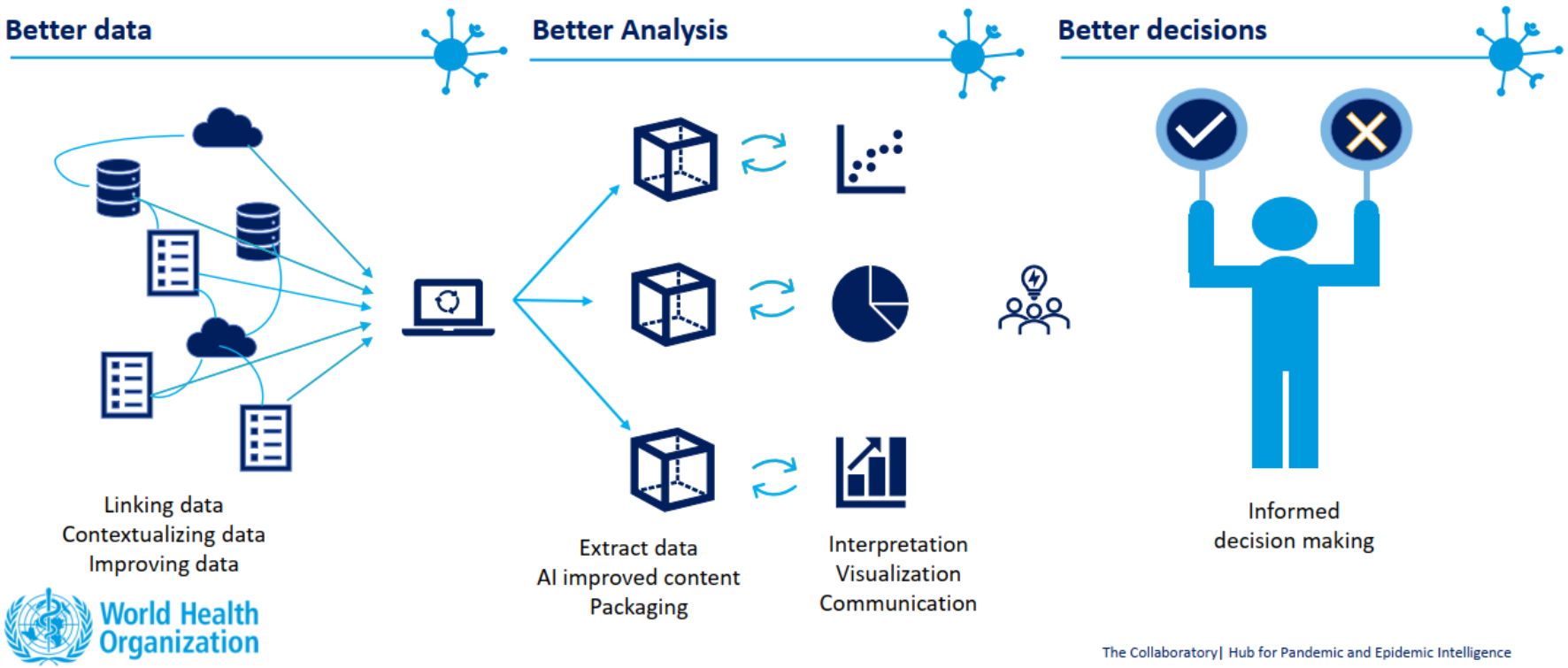
March 25, 2024

Collaboratory

Pandemic and Epidemic Intelligence

EpiParameter Community

Improved data and faster sharing of actionable insights



https://worldhealthorganization.github.io/collaboratory-epiparameter-community/#/

Global Repository of Epidemiological Parameters project (GREP)

Workstream 1: Prioritization of diseases and parameters

- 2023 the GREP database structure, disease prioritization, use cases were developed to assess the needs of the community and ensure long term success of the project.

Workstream 2: Extraction of parameters (including supportive tools)

- 2024 develop an automated pipeline to search for, identify and categorize primary research with epidemiological parameter data that is living (i.e., continuously updated) to feed new research into the GREP database.

Workstream 3: Storage and use of parameters

- 2023 Develop GREP database prototype.
- 2024 test GREP database and design tools to support the use of parameters stored in the database.

Workstream 4: Maintenance and validation of parameters

Workstream 5: Scientific recognition and other incentives

Today's Agenda

Presentations related to workstream 2

- The role of AI in living systematic reviews and evidence surveillance - **Lisa Waddell, PHAC**
- Evolution of AI Technology and Advancements for the Identification and Screening of Literature - **Emma Tomini, PHAC**
- Systematic Review Automation for Airborne transmission model **- Elias Sandner, CERN**
- CliZod, compiling the evidence on the climate sensitivity of zoonotic diseases **- Emilie Vallee, Massey University**

Discussion

Conclusion and way forward

Public Health Agency of Canada | Agence de la santé publique du Canada

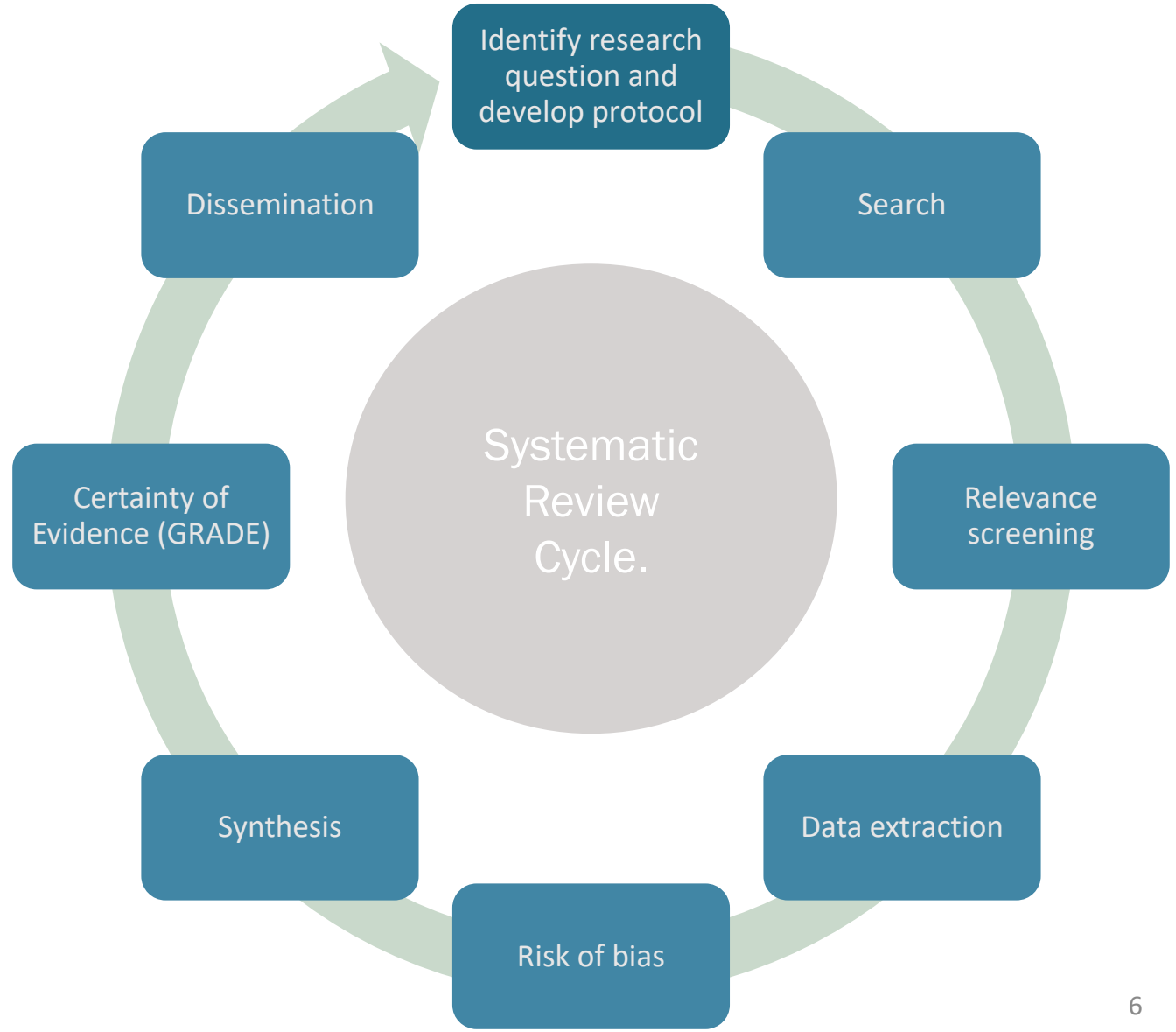
Canada

The role of AI in living systematic reviews and evidence surveillance

Dr. Lisa Waddell
Public Health Risk Sciences,
National Microbiology Laboratory, Public Health Agency of Canada
March 25, 2024

EVIDENCE SYNTHESIS

- Systematic review: **reproducible, objective methods** to identify, screen and summarize research relevant to a specific question.
  - Living systematic reviews are new and indicate a review is being **continuous updated** as relevant new evidence becomes available.
  - Other methods follow the same basic cycle: scoping reviews, rapid reviews, etc.
- Challenges:
  - This process is very labour intensive



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Perspective

Overcoming the challenges of using automated
for public health evidence synthesis

Lucy Hocking[1], Sarah Parkinson[1], Avery Adams[1], Emmanuel Molding Nielsen[1], Helena de Carvalho Gomes[2]

Many tasks in the evidence synthesis process are repetitive and could be well suited to using AI to automate these steps.

- Search for literature
- Deduplication of search results
- Screening literature for relevance
- Extracting data

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Artificial intelligence to automate th systematic review of scientific literature

Regular Paper | Open access | Published: 11 May 2023
Volume 105, pages 2171–2194, (2023) Cite this article

BMJ Open

Artificial intelligence in systematic reviews: promising when appropriately used

Sanne H B van Dijk [1,2] Marjolein G J Brusse-Keizer,[1,3] Charlotte C Bucsán,[2,4] Job van der Palen [3,4] Carine J M Doggen,[1,5] Anke Lenferink [1,2,5]

RESEARCH ARTICLE | Open Access

Data extraction for evidence synthesis using a large language model: A proof-of-concept study

Gerald Gartlehner, Leila Kahwati, Rainer Hilscher, Ian Thomas, Shannon Kugley, Karen Crotty, Meera Viswanathan, Barbara Nussbaumer-Streit ... See all authors

First published: 03 March 2024 | https://doi.org/10.1002/jrsm.1710

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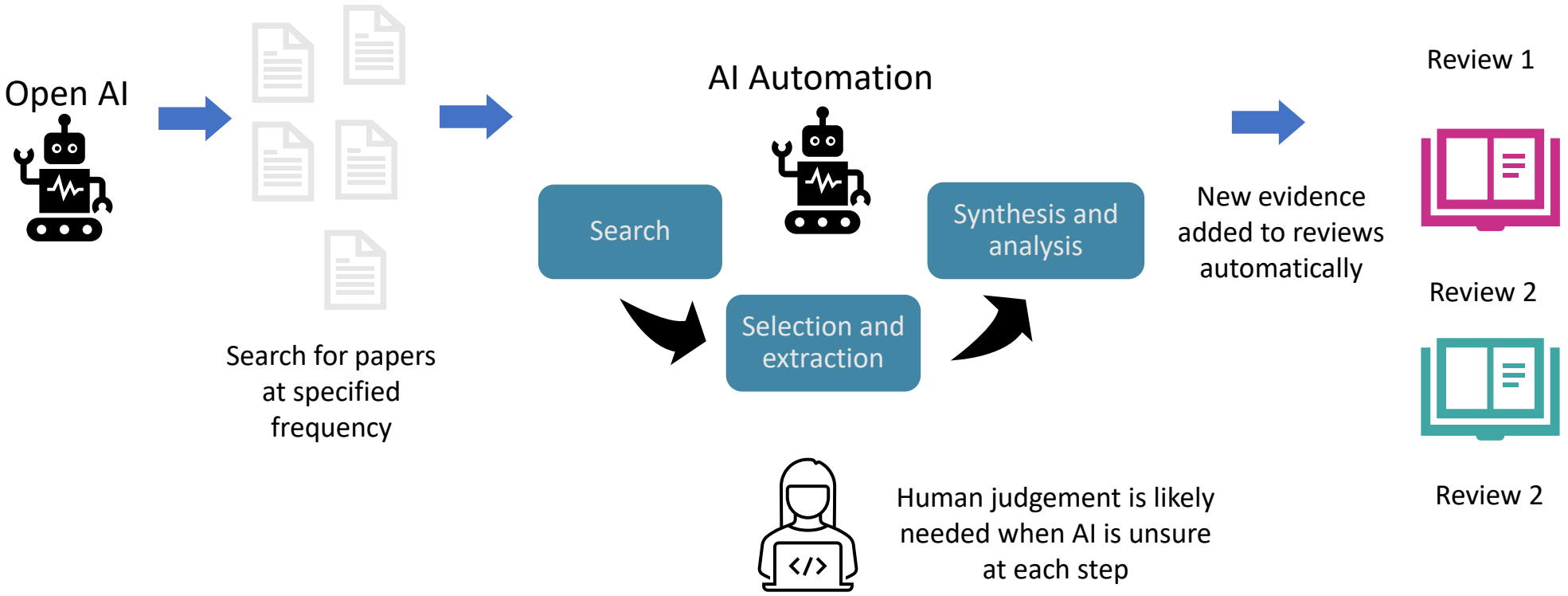
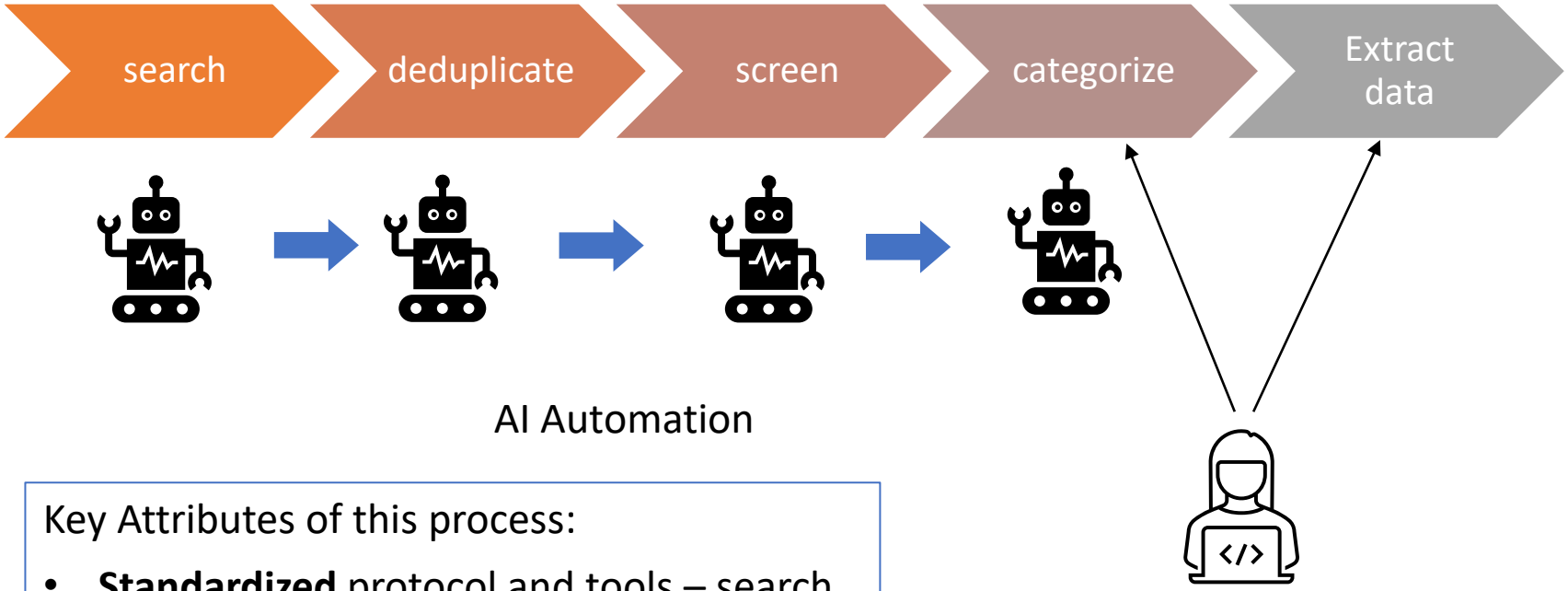
USE OF AI IN EVIDENCE SYNTHESIS

AUTOMATION IN THE EVIDENCE SYNTHESIS PROCESS

Ideally search, selection, mapping, and extraction would be automated



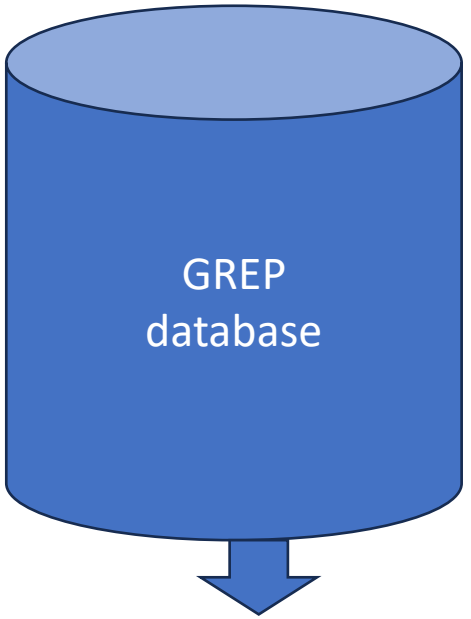
WORKSTREAM 2: PROCESS OF PARAMETER EXTRACTION



AI Automation

Human judgement is likely needed when

- AI is unsure.
- To do data extraction or validation of AI data extraction
- For quality assurance
- Management of workflow and feedback loops (TBD)



Access data & synthesize epidemiological parameter data on prioritized diseases
e.g., R packages and app interfaces to improve usability of the data

Key Attributes of this process:

- **Standardized** protocol and tools – search, screening, data extracted.
- Fate of citations identified by the search is "traceable" = **improved confidence** in the contents of GREP.
- Workflow designed to **minimize human resources** to manage the process.

CONSIDERATIONS

- Artificial intelligence models have been evolving rapidly →it seems increasingly realistic to automate some of the repetitive steps in the process.
  - This is critical to the success of the GREP initiative.
- There are many groups globally exploring the use of AI in evidence synthesis for a large range of products and topics because they offer:
  - Time-savings
  - Less costly
  - More efficient
  - Ideally, less prone to errors
  - Expedite review updates
- Significant effort to develop and validate the automated process is needed.

**AI has the potential to change the evidence synthesis process,
but it will take work to test and validate the tools.**