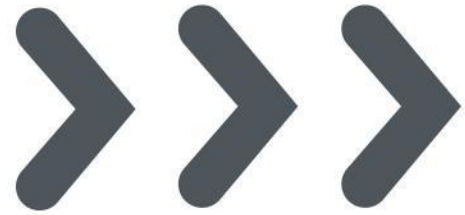


# Navigating the AI Revolution in Health Technology Assessments: Balancing Bias, Ethics, Time, Quality, and Evergreen Evidence



parexel®



# Our agenda for today



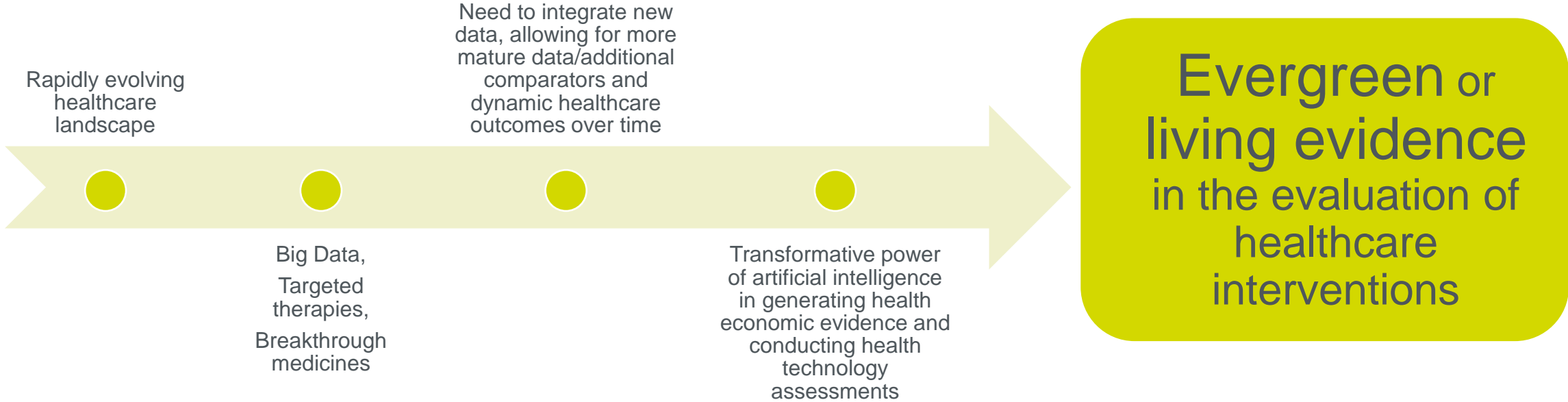
**Jacqueline Vanderpuye-  
Orgle, PhD**

Vice President and Global Head  
of Advanced Analytics, Parexel International

- › **An overview:** AI applications and ethical considerations
- › **CRO perspective:** AI deployment in SLR with pros and cons
- › **Technology developer perspective:** Responsible AI in healthcare
- › **Pharma perspective:** Insights from a frequent user
- › **HTA perspective:** AI applications and transferability



# AI applications and evergreen evidence



**Evergreen evidence** entails the **continuous integration of new data**, allowing for **dynamic decision-making** that reflects **real-world healthcare outcomes** over time

# Sample use cases of AI applications in HEOR and market access



## Literature reviews and cost effectiveness modelling

- › Accelerating systematic reviews
- › Enhanced data extraction and quality assessment
- › Natural language processing and social listening
- › Endpoint analysis and surrogate outcomes assessment
- › Quantifying uncertainties and evaluating scenarios
- › Dynamic evidence generation to support HTA submissions



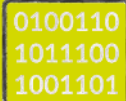
## RWD and algorithm development

- › Patient identification and optimizing protocol design
- › Supporting clinical trial feasibility and recruitment
- › Identifying patterns and trends in RWD
- › Machine learning DNA deep learning techniques
- › Accelerating analysis of big data/data lakes



## Reimbursement and pricing strategies

- › Estimating the value of healthcare interventions
- › Supporting value-based healthcare decision making
- › Optimizing patient access to new therapies
- › Enhancing affordability of healthcare services
- › Supporting sustainable healthcare systems



## Predictive analytics

- › Predicting patient outcomes and treatment response
- › AI in disease prevention and management
- › Early detection and intervention
- › Optimizing treatment pathways
- › Supporting clinical decision-making

# Patient perspectives and the drive for ethical and responsible applications of AI

- › Patients have a significant stake in guiding the development of AI
  - › for use as clinical decision support systems
  - › diagnostic tools
- › Approximately 70% of adults in the United States have concerns about the increased use of AI in healthcare
- › Similar trend across multiple surveys with results varying by type of task and patient demographics

Consensus shows a preference for medical professionals to handle healthcare tasks as opposed to AI-lead primary care

Comfort with select rapid diagnosis tasks: 78% for antibiotics needs; 77% for interpreting radiographs; 76% for bloodwork

Greatest concern for diagnostic errors and incorrect treatment recommendations

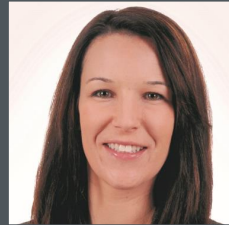
General belief that AI will improve healthcare in the long term by assisting rather than replacing clinicians

Younger patients were more willing to engage with a strong desire for inclusion in deployment

# Our speakers



**Rito Bergemann,  
MD, PhD**  
VP and Global  
Head of HEOR,  
Parexel  
International



**Denise Meade,**  
Senior Director,  
Health and Life  
Sciences,  
Microsoft



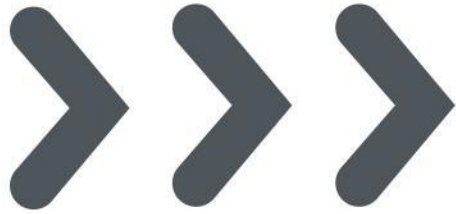
**Sugandh Sharma,**  
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Evidence  
Evaluation, HEOR,  
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International



**Raquel Aguiar-  
Ibanez,**  
Senior Director  
Outcomes Research –  
Center for  
Observational and  
Real World Evidence  
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**Dalia Dawoud, PhD,**  
Associate Director  
(Research),  
NICE



**Rito Bergemann, MD, PhD**  
Vice President and Global Head of HEOR,  
Parexel International

# AI applications and ethical considerations



# Artificial Intelligence (AI) and Human Intelligence (HI)

**AI is a toolbox**



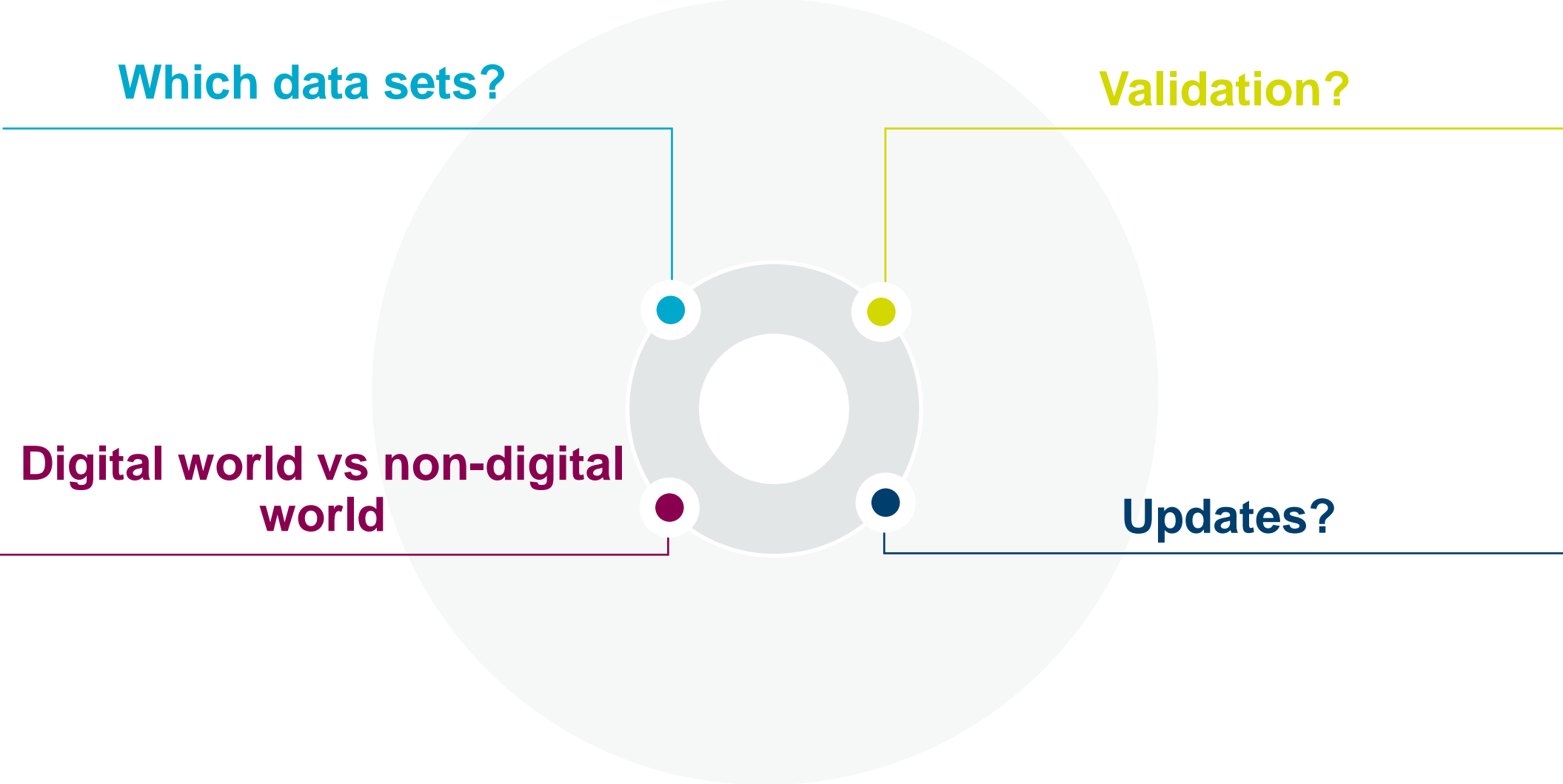
**AI is not replacing HI**

**Use of AI without human control is unethical and not acceptable**





# The importance of transparency in AI algorithms



# Ethics and governance



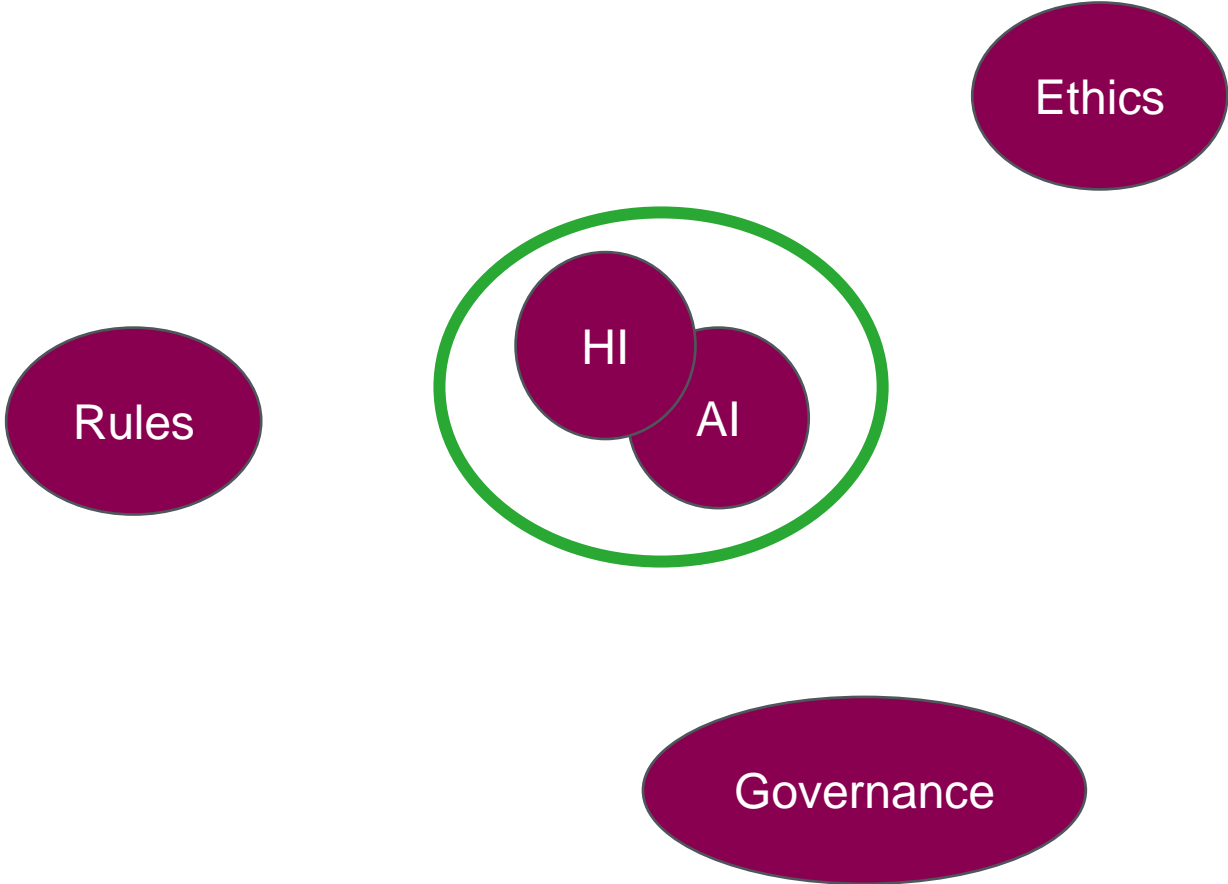
Why ethics?



Why governance?



Why rules?



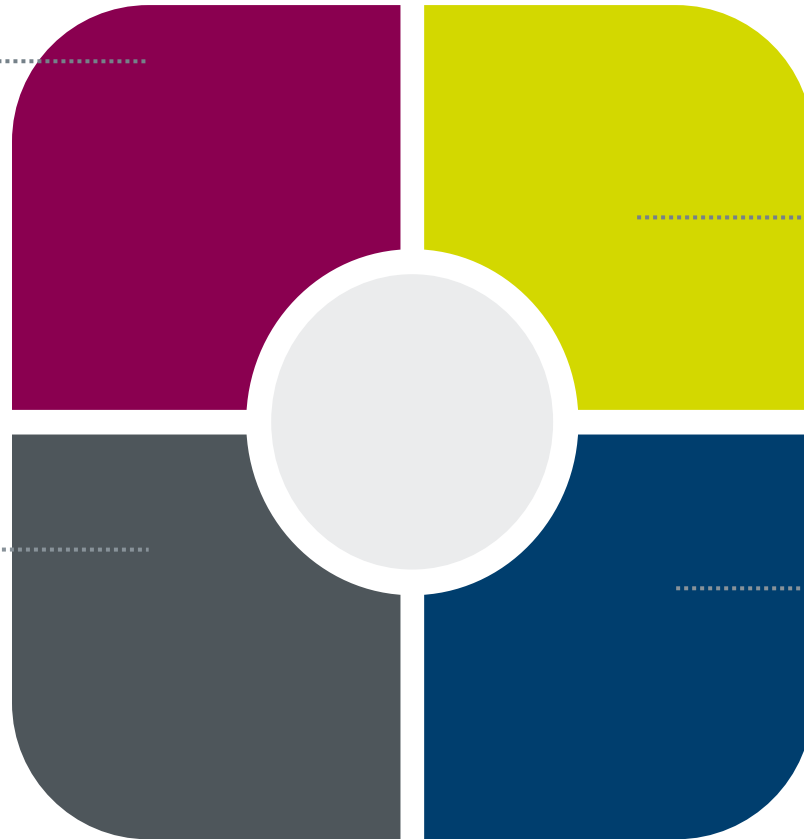
# Exploring bias

Programming

Training data sets

Diversity

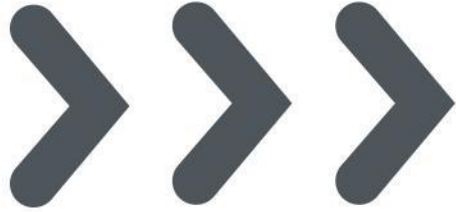
Goals for AI algorithms



# Questions to AI and to HI



Any HTA /  
governmental  
body



**Denise Meade**

Senior Director, Health and Life Sciences,  
Microsoft

Disclaimer: Viewpoints expressed in this presentation are personal and do not represent the views of Microsoft Corporation.

# Responsible AI in healthcare



# The Need for Responsible AI



The FDA has approved more than 200 AI/ML enabled medical devices

- Radiology is by far the most common use case, with cardiovascular and neurology also common
- Significant growth over last 3-5 years as AI methods have matured
- Digital health tools continue to be a significant focus of Healthcare investors and sponsors



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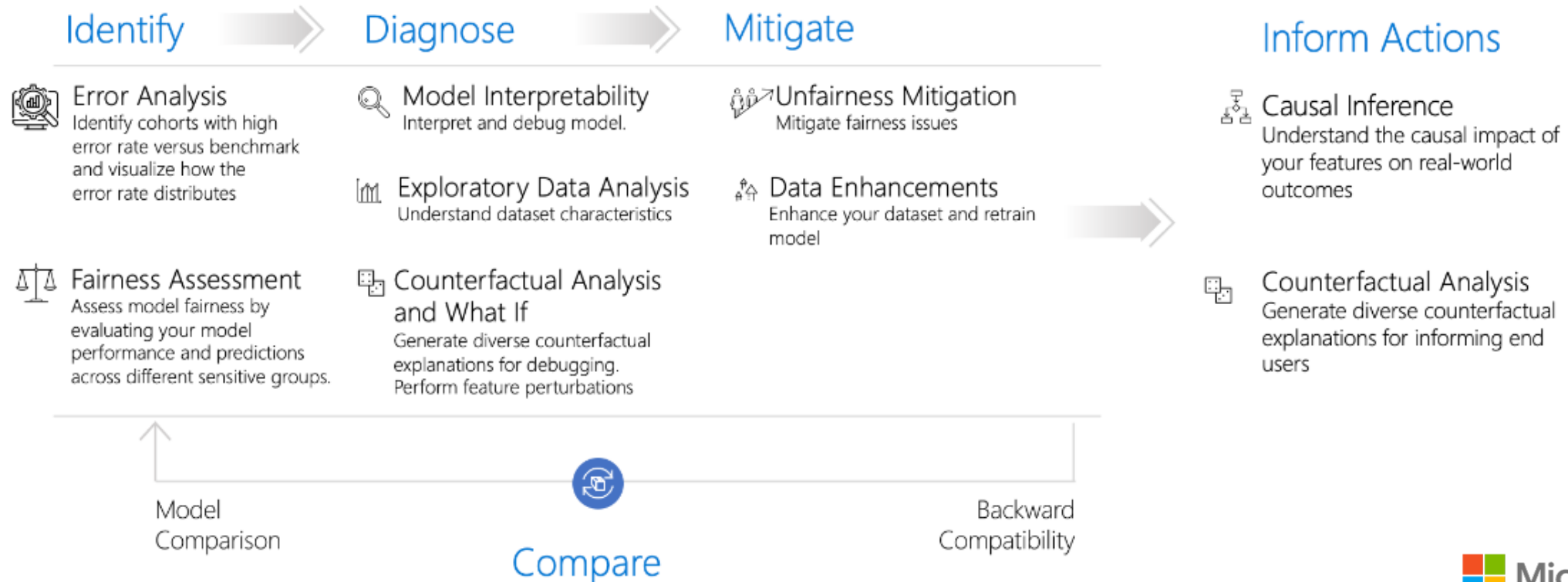
# Defining Responsible AI

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- Fairness
- Reliability & Safety
- Privacy & Security
- Inclusivity
- Transparency
- Accountability

# A Practical Approach for implementing Responsible AI

- Leverage open-sourced, available tools for model and data exploration and assessment
- Use user interfaces and libraries that enable a better understanding of AI systems
- Empower developers and stakeholders of AI systems to develop and monitor AI more responsibly and take better data-driven actions





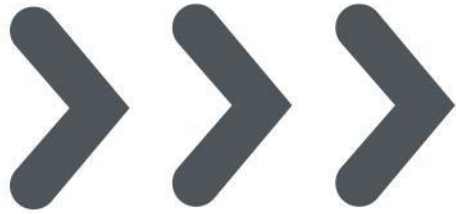
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## **Addressing Therapeutic Challenges with AI**

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Therapeutic development challenges that can be met with AI

- Diversity requirements
- Enrollment target
- Integrity and fraud detection
- Reproducibility and reliability
- Resource limitations



**Sugandh Sharma**

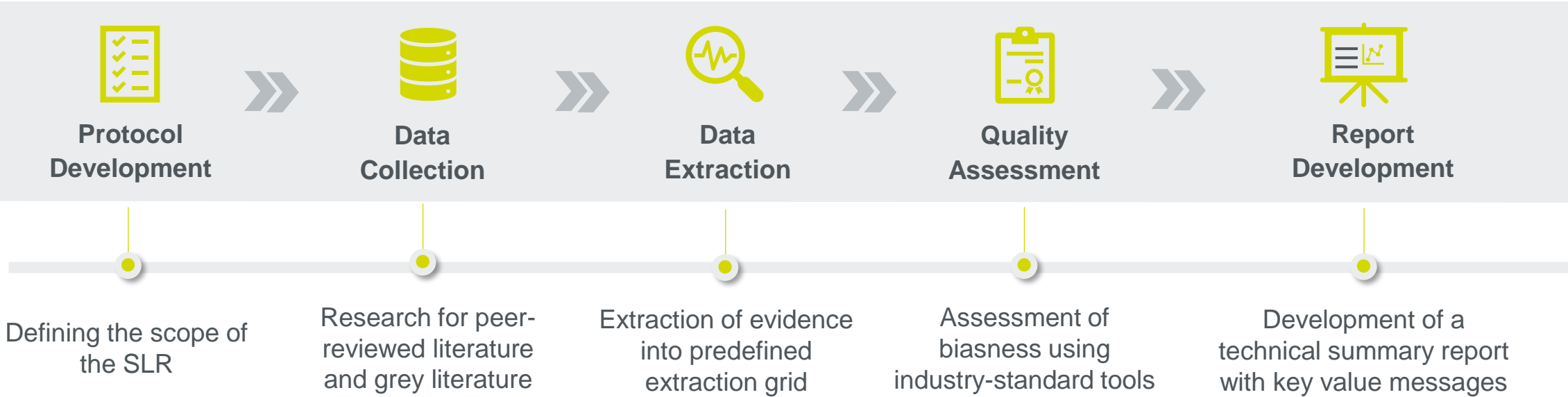
Senior Director Evidence Evaluation,  
HEOR,  
Parexel International

# AI deployment in SLRs with pros and cons

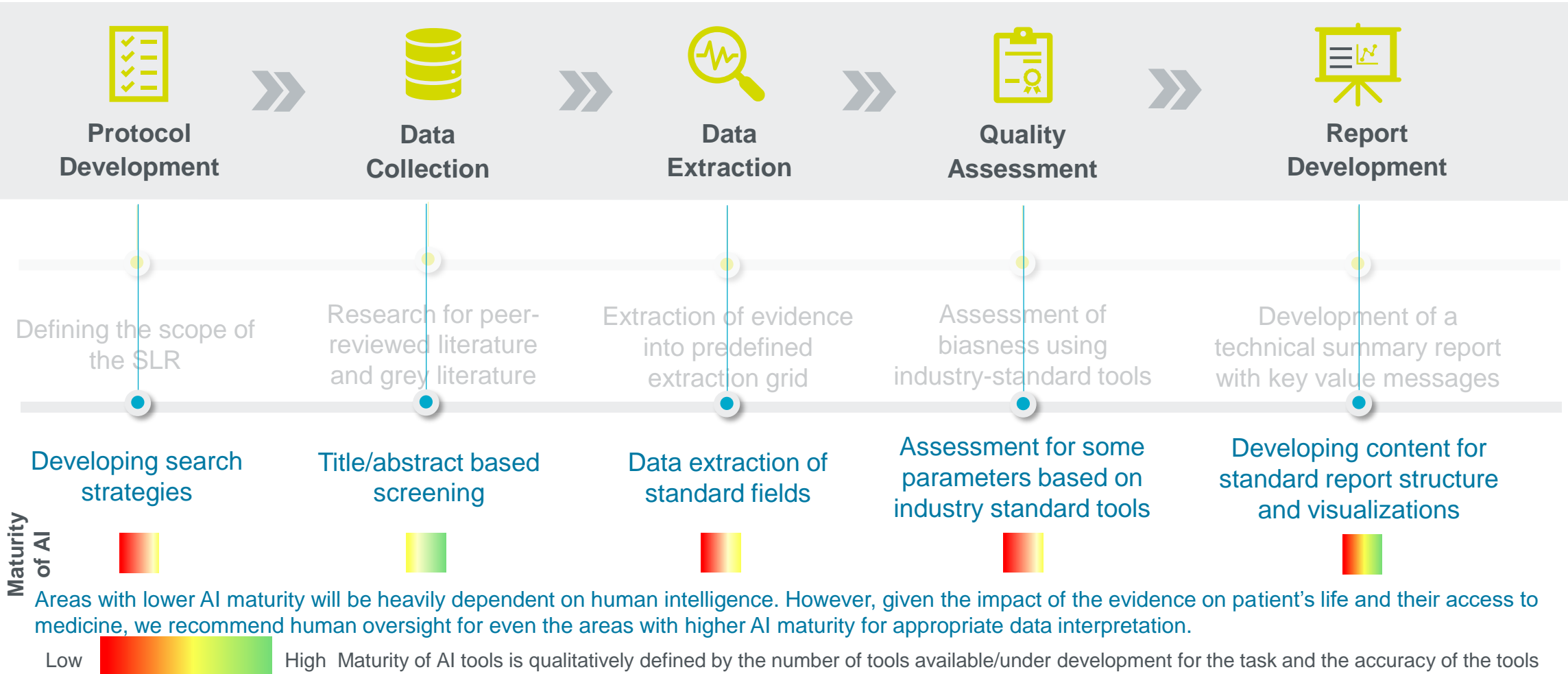


# SLRs – an important tool for evidence-based medicine

- › Aim to comprehensively identify evidence related to clinical, economic and humanistic outcomes
- › Considered gold standard by HTA agencies



# Potential application of AI in SLRs



Areas with lower AI maturity will be heavily dependent on human intelligence. However, given the impact of the evidence on patient's life and their access to medicine, we recommend human oversight for even the areas with higher AI maturity for appropriate data interpretation.

# Living SLR/Evergreen evidence

- With the rapidly changing landscape, it is important to keep the evidence up-to-date
- Living SLR/evergreen evidence allows us to keep the literature review updated in real-time i.e., as soon as a new citation is published
- Technology specifically AI plays a critical role in defining and streamlining the process of living SLR



# Pros of AI implementation



- Living SLRs/evergreen evidence
- Faster turnaround of SLRs
- Reduction of human errors e.g., erroneous data capture and transfer
- Standardized output
- Enhanced visualizations and data representation

# Caveats/cons of AI implementation

- AI black box – Lack of transparency of the algorithm used by AI for decision-making
- AI output dependent on the quality/biasness in the training set
- Ethical implications due to lack of clarity and transparency and potential for bias in the decision-making



# AI deployment in SLRs – The way forward



AI needs to be **augmented by human review** at every step to ensure high quality and patient focus

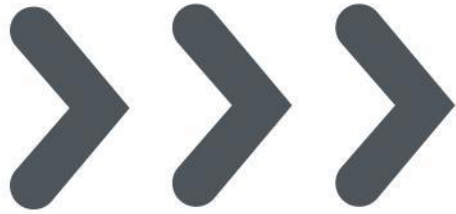


Important to ensure **variability in the training data set** for unbiased output by AI algorithms



**Responsible use of AI** at labor-intensive steps for evergreening of evidence





**Raquel Aguiar-Ibanez,**  
Senior Director Outcomes Research – Center for  
Observational and Real World Evidence (CORE)  
Merck Canada Inc., Kirkland, QC, Canada

Disclaimer: I am an employee of Merck Canada Inc., Kirkland, QC, Canada, a  
subsidiary of Merck & Co., Inc., Rahway, NJ, USA.

The views and opinions presented here are my own and do not necessarily  
reflect those of MSD.

# Insights from a frequent user

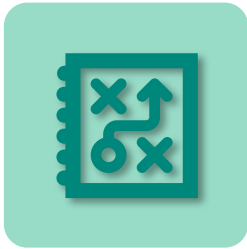




- Rapidly changing external environment requiring increased efficiency within shorter timelines, to support decision making and earlier access for patients to innovative, beneficial medicines
  - E.g., COVID-19 pandemic, EU HTA regulation
- Need optimised processes, reduced time spent, costs and overall timelines, to ensure decisions are made on a timely manner, based on robust, most up-to-date scientific evidence and following HTA requirements



- Areas of:
  - High priority
  - Rapid emerging evidence generation
  - High uncertainty
  - Where new research can change clinical practice and/or policy decision making



- Activities/processes where AI/ML-based assistance has demonstrated potential to save human effort, time and costs:
  - Screening
- Potential to support:
  - Search updates (searches within 6 months of HTA submission, but need ongoing updates of search terms)
  - Data visualization and reporting of large SLRs (reporting + validation)
- Higher uncertainty levels regarding AI/ML-based assistance for more 'complex' tasks (e.g. data extraction, quality assurance and interpretation)



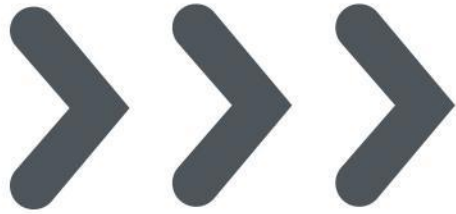
- Many available tools → use the right tool for the right job
- Repository of available tools for SLRs in [The Systematic Review Toolbox \(systematicreviewtools.com\)](https://systematicreviewtools.com) (not all AI/ML-based)\*
  - Need to provide information on tool validation and performance indicators
- Checklists are needed specific to the use of AI/ML in HTAs/SLRs (is PALISADE fit-for-purpose for this context?) that assess transparent reporting and minimum validity of these tools



- Transparency is key to understand what the algorithms do and when/where they are used
- Important to communicate how algorithms are trained, and what accuracy/performance is seeing for different processes/tasks
  - Information on the number of SLRs/elements used to train and validate tools is helpful, but even more how reviews/data used to train algorithms are selected (flawed SLRs used for training purposes will introduce unintended biases)
  - Performance measurements: accuracy, precision, recall, etc.



- Extent of use will be determined by HTA agency requirements
  - Are AI/ML-based tools in good shape to be accepted by HTA agencies?
  - What operational aspects will agencies agree to be automated through AI/ML?
- Global vs. country/agency-specific perspective:
  - Overall acceptance vs. acceptance by few agencies will determine the level of adoption
- Constant adaptability, collaboration, education and communication
- ML as augmentation, not human replacement



**Dalia Dawoud, PhD,**

Associate Director (Research)

Science Policy and Research Programme  
Science, Evidence and Analytics Directorate

NICE

Disclaimer: No interests to declare. The views expressed are those of the presenter and not those of NICE

# HTA perspective: AI applications and transferability

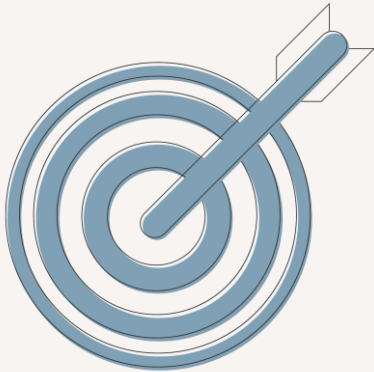


# To better serve people and the health and care system, NICE is evolving in 3 ways

We've listened to our stakeholders. While preserving our core values of transparency, rigour and independence, we need to change.

1

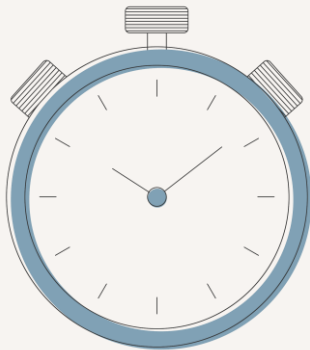
**More relevant**



...by focusing on what matters most

2

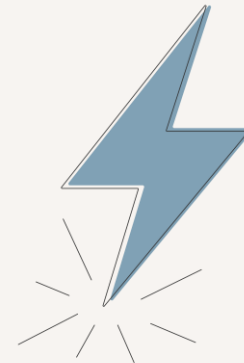
**More timely and usable**



...by providing useful and usable advice

3

**Greater demonstrable impact**



...by learning from data and implementation

# AI/ML at NICE

## Using

- Internal working
- Guideline development

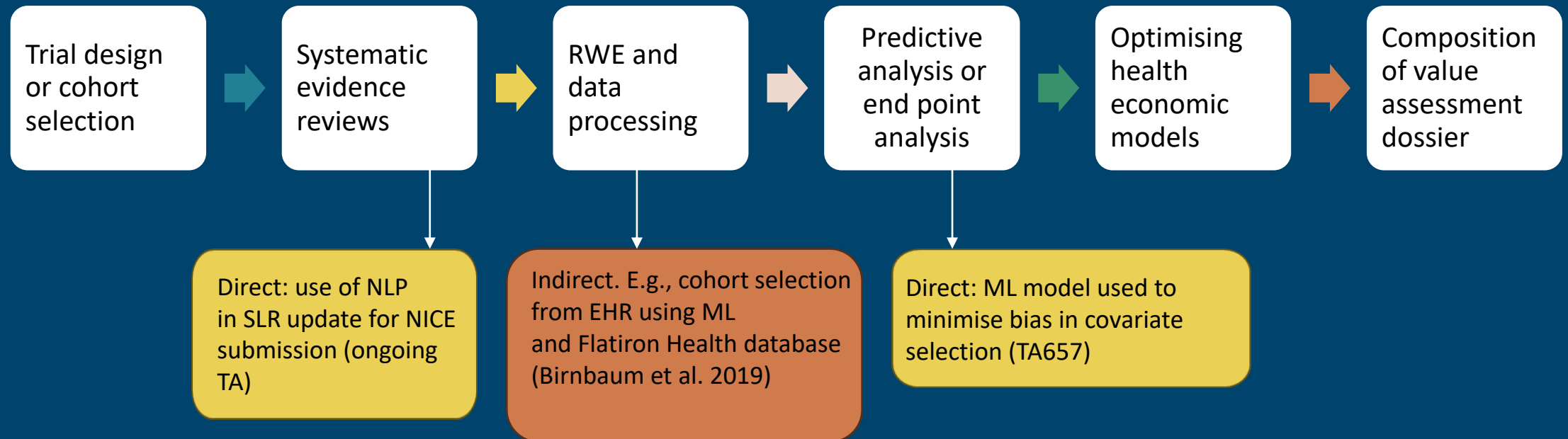
## Evaluating

- AI/ML enabled digital health technologies
- AI/ML methods used in evidence generation

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# AI/ML methods in evidence generation for HTA

Limited use of AI or ML in Health Technology Assessment (HTA) so far, but it is increasingly being explored.





# Guidance on the use of AI in evidence generation for HTA

Currently, there is no specific guidance on the use or reporting of use of AI in submissions to NICE

## NICE AI Principles

- Human oversight and final decision-making authority.
- Augmentation, not replacement.
- Ethical considerations.
- Continuous monitoring and feedback

## RWE Framework

- Aim to include best practice principles for diagnostic and predictive studies, where appropriate
- further considerations for the use of AI and machine learning in these kinds of studies. Potential for development of sections covering use of AI/ML for unstructured data, federated data networks, and causal analysis in the future.

## Guidelines Manual

- Alignment of our technology evaluation methods manual
- Information Services and Centre for Guidelines continue exploring the use of using NLP in improving/automating searches

## PALISADE Checklist

- Developed by ISPOR ML Emerging Good Practice Task Force
- Provide a credible starting point for developing more detailed guidance

## Research Projects

- Learning from our AI/ML related research projects (e.g. HTx, IMI EHDEN, IHI IDERHA)

# Challenges to using AI/ML

## **Ensuring the rigour, transparency, explainability, and reproducibility**

- concerns regarding how AI systems arrive at their decisions or recommendations
- challenging to identify and address potential biases or errors

## **AI systems can introduce or reflect bias and discrimination**

- in patterns of health discrimination within RWE datasets
- in data representativeness
- in human choices made during the design, development, and deployment of models.

## **Possibilities of ‘hallucinations’ or ‘confabulation’**

- where AI systems can sometimes generate inaccurate outputs

**Accounting for these challenges requires proactive measures and ongoing evaluation and development.**

# Next steps

- 1. Highlight areas of high or low risk of use of AI in submissions to NICE**
  - Human oversight and augmentation, not replacement
- 2. Developing standards, validation (model performance) and evidence requirements for use in NICE submission**
  - Transparent and explainable AI algorithms and models
  - Guidance from regulators
- 3. Exploring where and how expertise in AI can contribute to NICE appraisals, either via committee membership and/or supporting evidence critiques**



# Beyond NICE



**frontiers** | Frontiers in Public Health

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## Recommendations to overcome barriers to the use of artificial intelligence-driven evidence in health technology assessment

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### Human-factor-related barriers:

- Lack of decision-makers' expertise about the methods and use of AI driven scientific evidence
- Lack of appropriate skills for applying AI methods (natural language processing, machine learning etc.) in outcomes research
- Lack of adequate education to generate AI driven scientific evidence

### Regulatory and policy-related barriers

- Lack of awareness and openness on the part of decision-makers to rely on AI-based real-world evidence
- Lack of political commitment (e.g., no health digitization strategy in the country to establish relevant databases)
- Regulatory compliance issues in the process of managing a high volume of sensitive information

NICE



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 825162.

# Beyond NICE



## Data-related barriers

- Issues with reliability, validity and accuracy of data (e.g., due to the lack of quality assessment of data entry or self-reporting)
- Multinational data collection and analysis is limited due to differences in the coding systems across countries, and the lack of mapping methods to standardize the vocabulary
- Analysis of multicentre data is limited due to differences in database structures across systems (e.g., electronic medical records database of different service providers)
- Raw, fragmented or unstructured data (e.g., electronic medical records, imaging reports), which are difficult to aggregate and analyse
- Systemic bias in the data (e.g., due to upcoding)
- Lack of well-described patient-level health databases
- Data that are relevant for research purposes (e.g., important clinical endpoints) are missing from databases or are available only on paper.



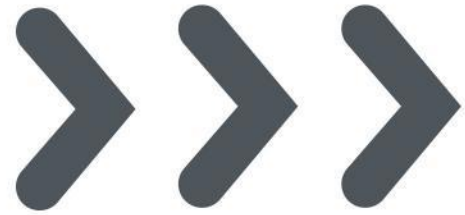
## Technological barriers

- Lack of resources to build and maintain IT infrastructure to support AI process
- High cost of improving data validity (e.g., data abstracters to evaluate unstructured data)

NICE



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 825162.



# Concluding remarks



**Jacqueline Vanderpuye-  
Orgle, PhD**

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of Advanced Analytics, Parexel  
International

- AI does not mean HI is becoming obsolete
- HI is critical to ensure responsible development and deployment of AI within ethical bounds
- Various potential applications of AI in evidence generation to drive efficiency and precision
- AI allows for living evidence and dynamic evaluations of innovative medicines
- Current tools help set guardrails for AI but more work needs to be done to drive consensus for healthcare evidence generation and decision-making



# Questions?



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# Thank you

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