



Institute  
and Faculty  
of Actuaries



IAAHS  
Health

# Impactability Modelling for Population Health Management

## A review of current concepts and practices

Population Health Management  
Working Party

Presented to the International Actuarial Association  
Health Section (IAAHS)

1<sup>st</sup> December 2020





Institute  
and Faculty  
of Actuaries

# Introduction

## Background to the Working Party

Alpesh Shah



# Introduction

- Population Health Management in the NHS
- Genesis of the PHM working party
- Focus on Impactability Modelling for this phase
- First report on current concepts and practices:
  - Definition
  - Practical challenges
  - Examples of models
  - Ethics and patient view





Institute  
and Faculty  
of Actuaries

# Defining impactability

Overview, principles, problem statements

Dr. Chris Martin



# Defining Impactability

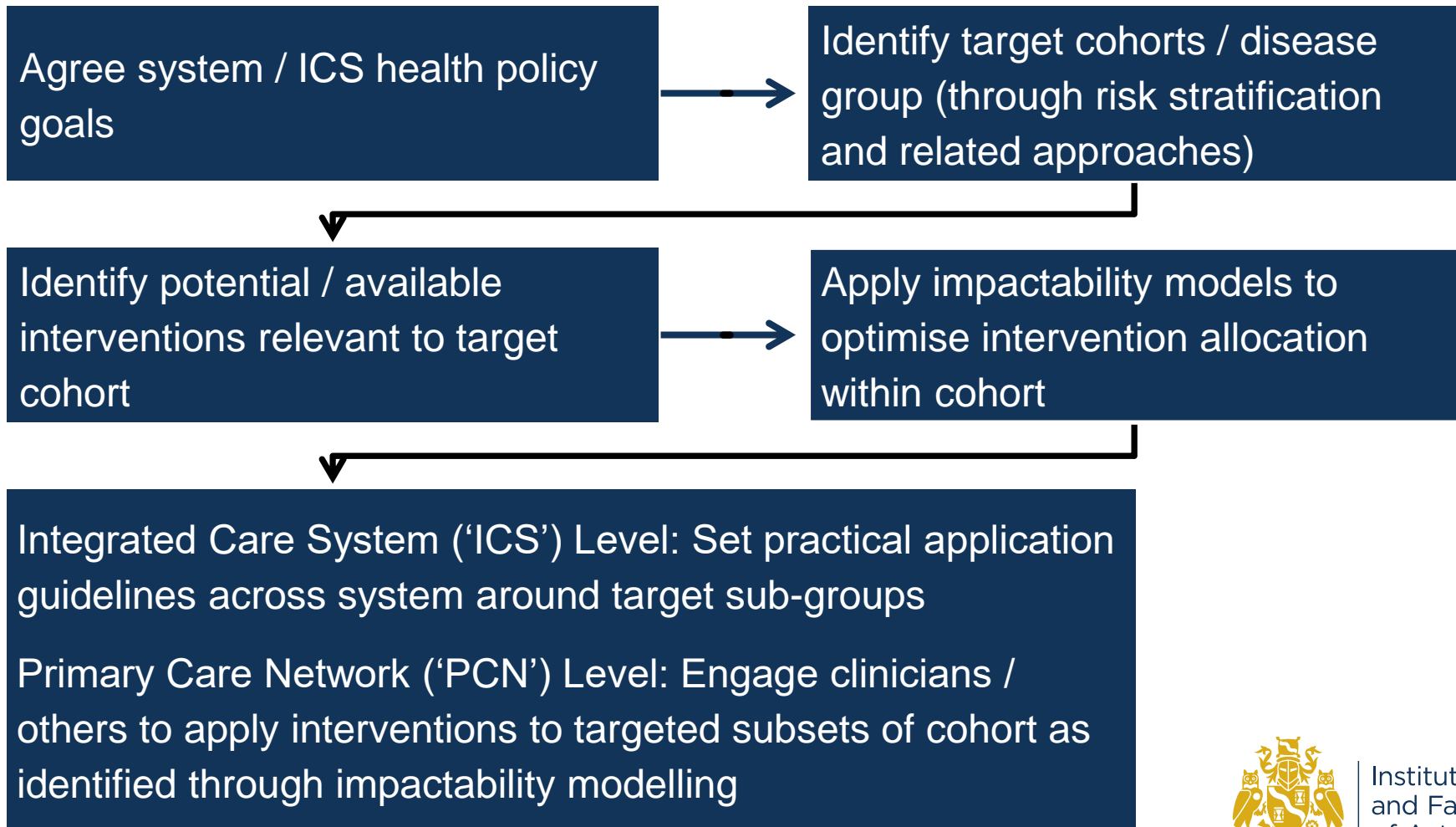
- No universally accepted definition exists
- Working party technical definition of impactability and impactability modelling:

***Impactability:*** defines the degree to which different sub-populations will benefit from a range of interventions

***Impactability modelling:*** uses this information to tailor appropriate interventions within agreed boundaries for the 'value' gained from resources spent



# The role of Impactability within PHM





Institute  
and Faculty  
of Actuaries

# Practical considerations

What are the barriers and enablers to effective impactability modelling?

Lisa Morgan



# Practical considerations

- **Purpose of research:** identify key themes from current and potential end users of impactability modelling and document these insights as well as related advice
- **Observation:** knowledge and use of impactability modelling is comparatively sparse – limited the research, however, highlights future opportunities
- **Research methodology:**
  - 10 semi-structured interviews with key personnel involved in the development, application or study of PHM programmes involving risk stratification and impactability modelling
  - Literature review searching the Embase database

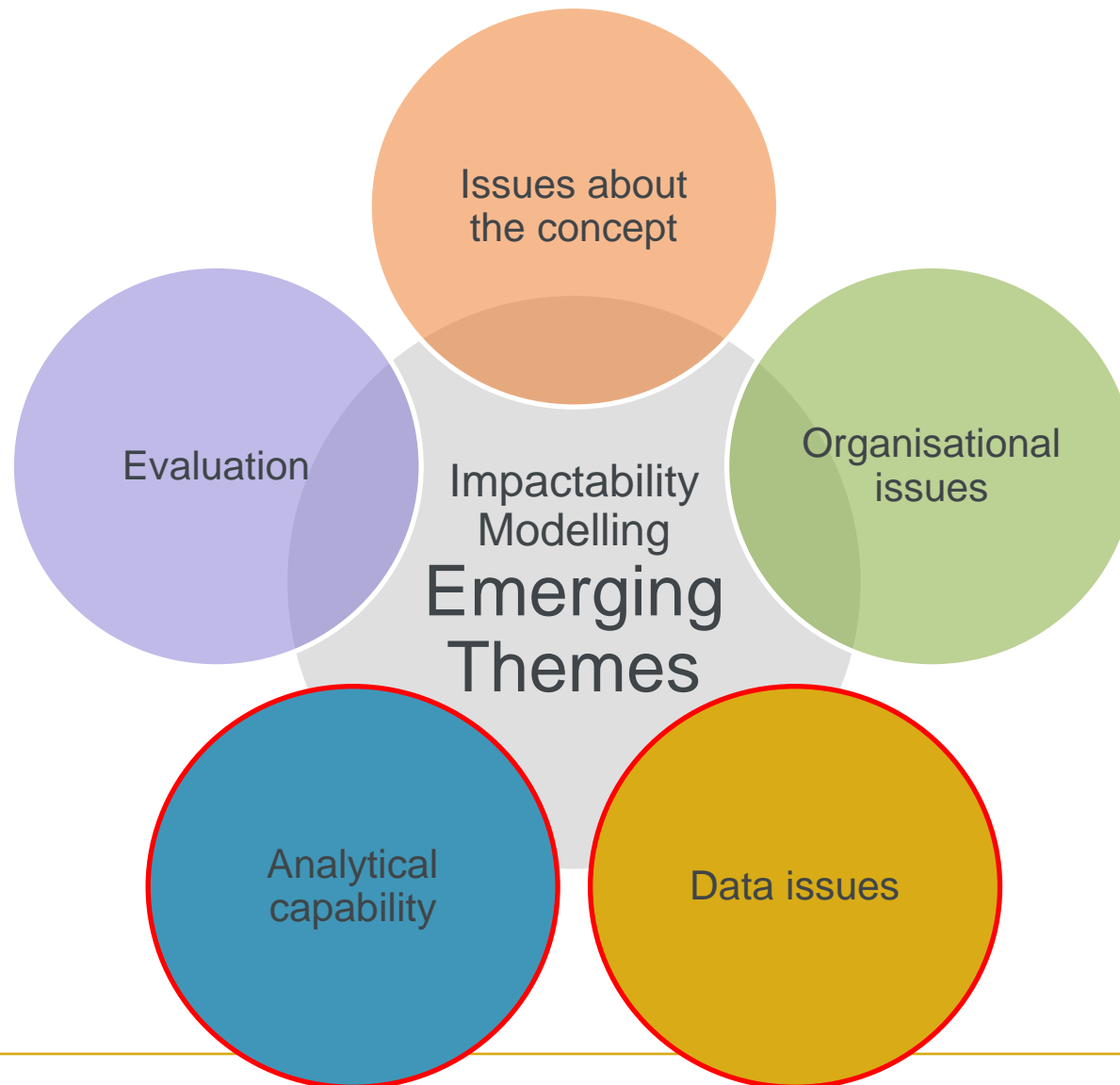




# Practical considerations – Emerging themes



# Practical considerations – Emerging themes



# Practical considerations – Emerging themes

- **Availability of resources** – awareness, diversion to statutory returns.
- **Handling results** - communication & visualisation.
- **Common pitfalls in analysis** - changes over time and ‘downstream’ effects.
- **New methods** – Artificial intelligence and machine learning brings its own challenges.

about  
cept

ability  
ing  
giving

Themes

Organisational  
issues

Analytical  
capability

Data issues



Institute  
and Faculty  
of Actuaries

# Practical considerations – Emerging themes

- **Availability of resources** – awareness, diversion to statutory returns.
- **Handling results** - communication & visualisation.
- **Common pitfalls in analysis** - changes over time and ‘downstream’ effects.
- **New methods** – Artificial intelligence and machine learning brings its own challenges.

## Quality

- Consistency,
- completeness,
- Vagueness.

## Access

- Types of data,
- Regulation,
- Searchability.

Analytical capability

Data issues



Institute and Faculty of Actuaries

# Data issues – recommendations

## Improving and standardising access to data

- Prepare a well-crafted business case and engage with stakeholders and ethical reviewers early for accessing data to gain the trust of data guardians;
- Build an open and transparent compliance infrastructure for data handling; and
- A phased approach to systems integration across organisations may have a greater chance of success than a waterfall approach where all systems change at once.



# Analytical capability – recommendations

- Local involvement across the UK as data is only held on local systems.
- Develop ‘hubs of excellence’ that would allow skills and resources to provide analytic services to organisations across the NHS.
- Increase the number of analysts and **broaden analysts’ skillset**. Strengthen of reporting, data visualisation skills and verbal presentations.
- Consumers of the results of risk-stratification and impactability modelling need training for proper understanding and application.
- Greater collaboration between analysts and clinicians to develop and refine impactability models and implement with patient care.
- A cultural change to get clinicians and analysts working together more closely.





Institute  
and Faculty  
of Actuaries

# Examples of models

Focus on a selection from the wide range of approaches

David Beddows



# Examples of impactability models

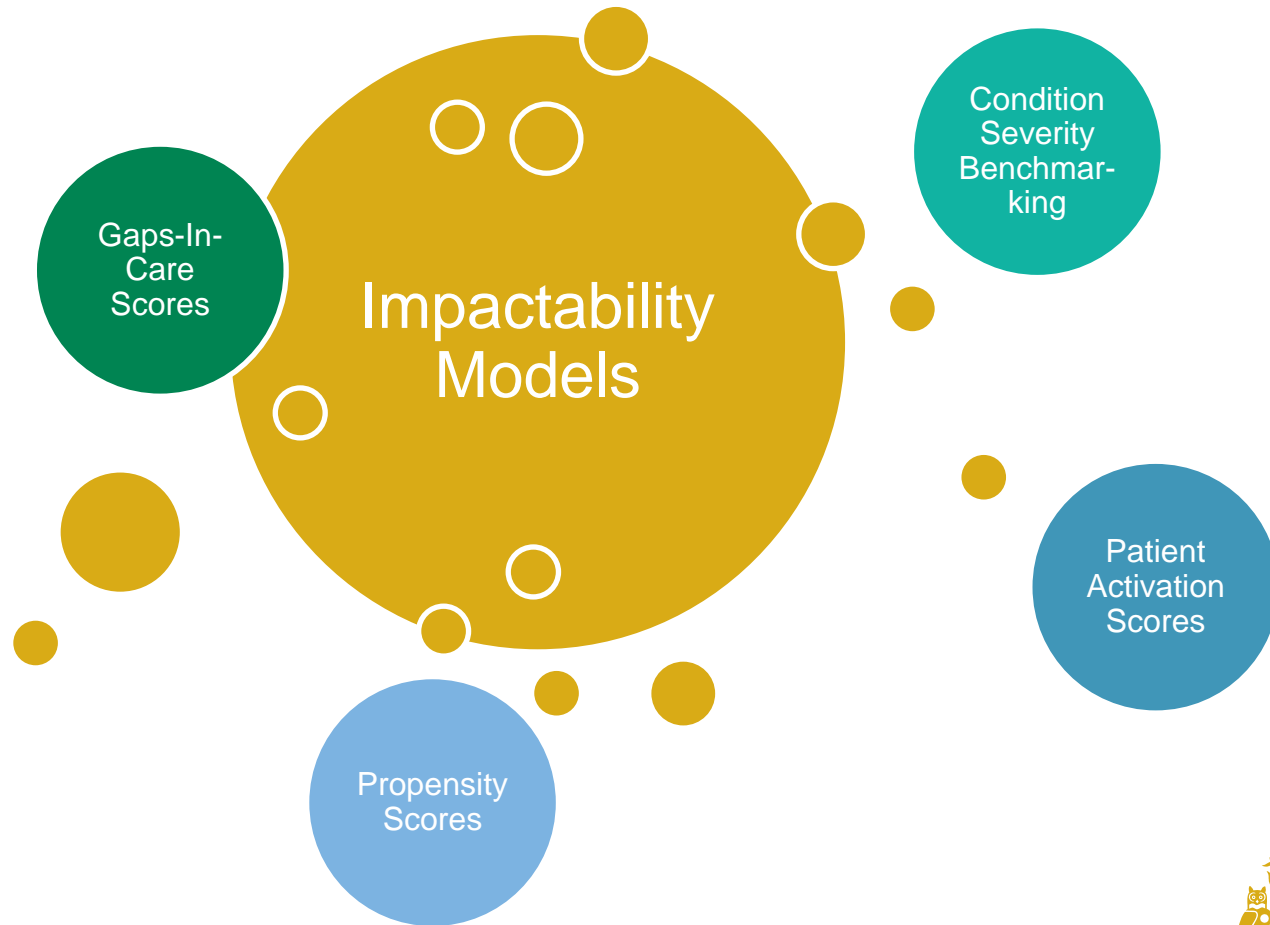


Wide range of diverse approaches and input requirements





# Examples of impactability models



# Gaps-in-Care Scores

Compare a person's treatment received versus standard treatment guidelines for their condition.

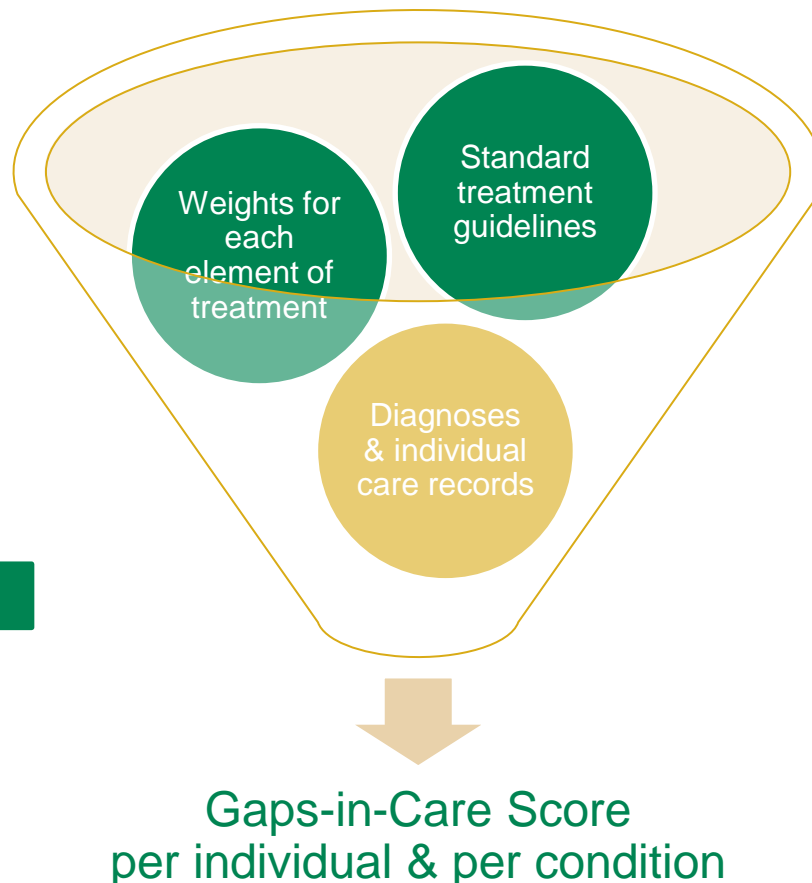
Calculate a score for their gaps-in-care by applying weights to each element of treatment.

Higher scores imply higher impactability.



Consistency of treatment  
Impact is measurable  
Reduces inequalities

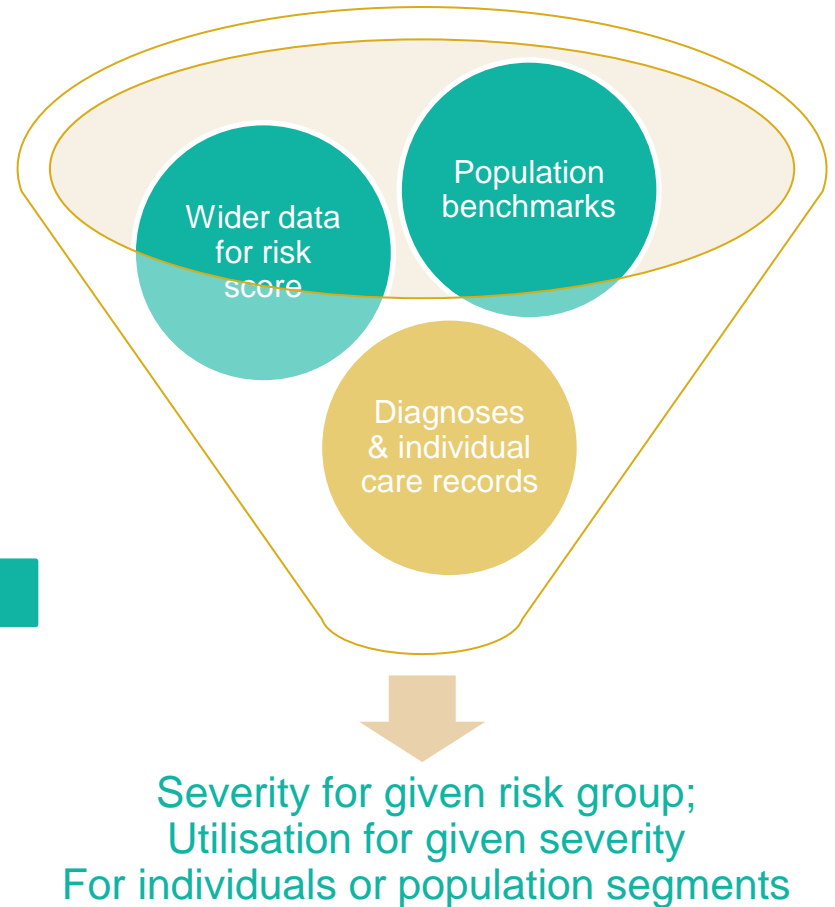
Treatment guidelines may not be available  
Challenge to set weights



Institute and Faculty of Actuaries

# Condition Severity Benchmarking

Compare condition severity or health service utilisation rates against benchmark levels for given conditions or risk segments. Individuals or groups with values outside the expected ranges are considered to be impactable.



Uses data that is routinely collected  
Creates the metrics for measuring itself

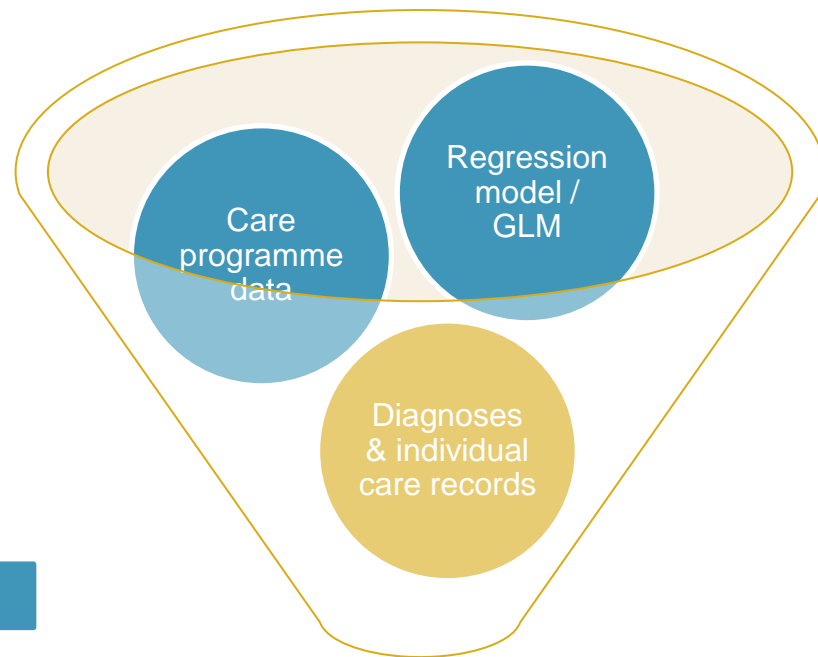
Challenge to define “severity” and “risk” and expected ranges of values  
Says nothing about treatments



Institute  
and Faculty  
of Actuaries

# Propensity Scores

Identify individuals for specific treatment plans based on a score calculated with a statistical model and risk and health data.



Propensity-to-benefit score;  
For individuals or population segments;  
For a specific care programme

Leverages statistical methods and big data  
Aligns patients to care programmes

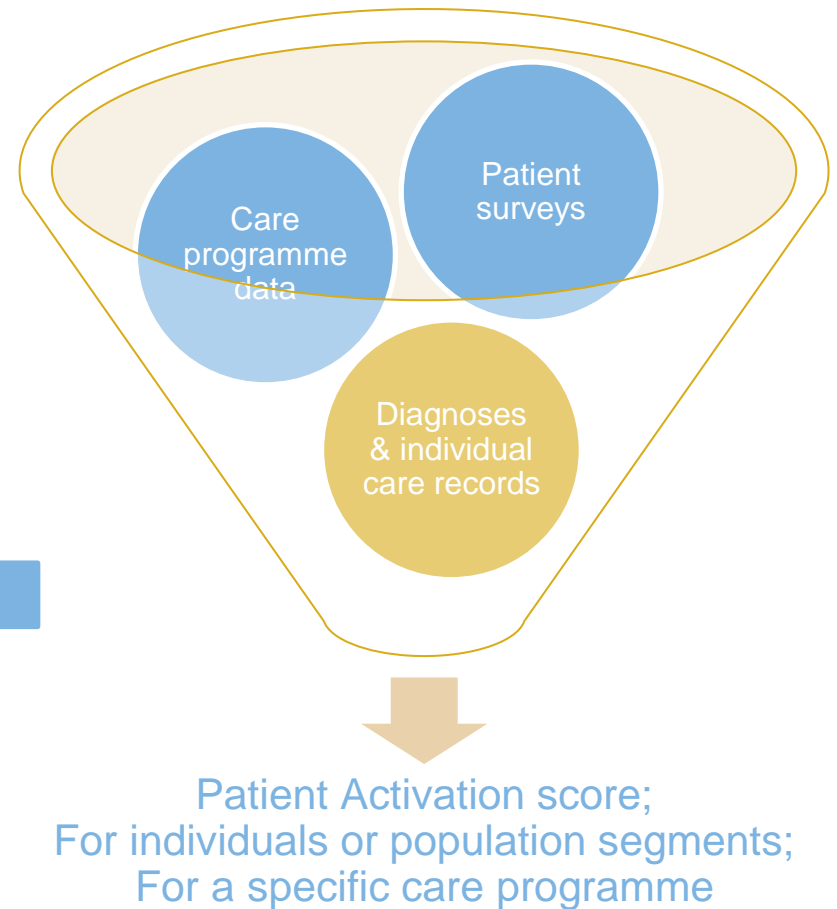
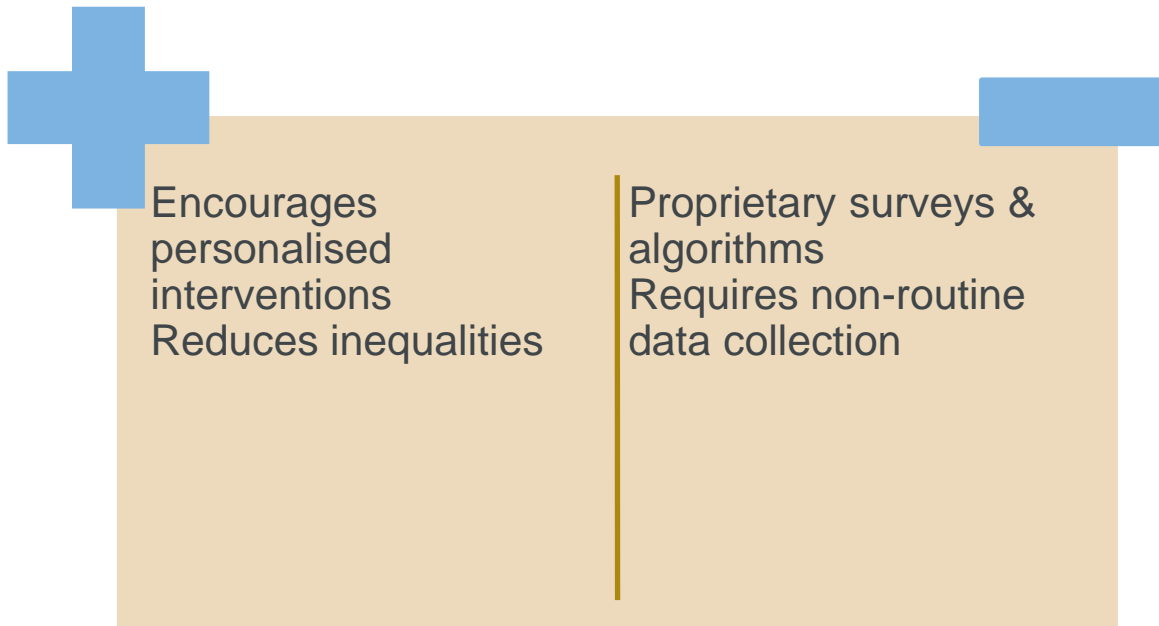
Challenges around accuracy of results, e.g. risk of false-positives  
Requires historical results of treatment plans  
Not a single clear choice of statistical model



Institute and Faculty of Actuaries

# Patient Activation Scores

Conduct detailed questionnaires of individual patients and develop measures of patient activation from the results.





Institute  
and Faculty  
of Actuaries

# Ethics & Patient View

Josephine Robertson



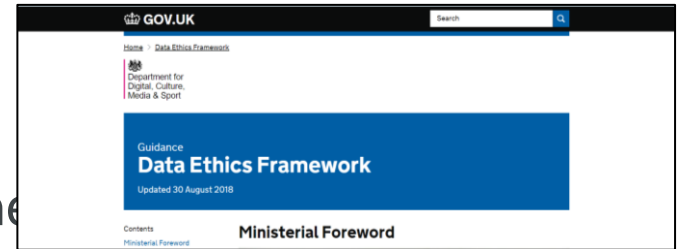
# Ethics and Patient Involvement

- Range of ethical considerations when developing an Impactability model:



# Ethics: Data In

- Leverage existing frameworks
- Key considerations:
  - Clarity on purpose and expected patient benefit
  - Only necessary data is collected, stored, used
  - Relevant data sharing agreements and privacy impact assessments
  - Data security integral to design of model
  - Transparent about limitations and biases in data and its intended use





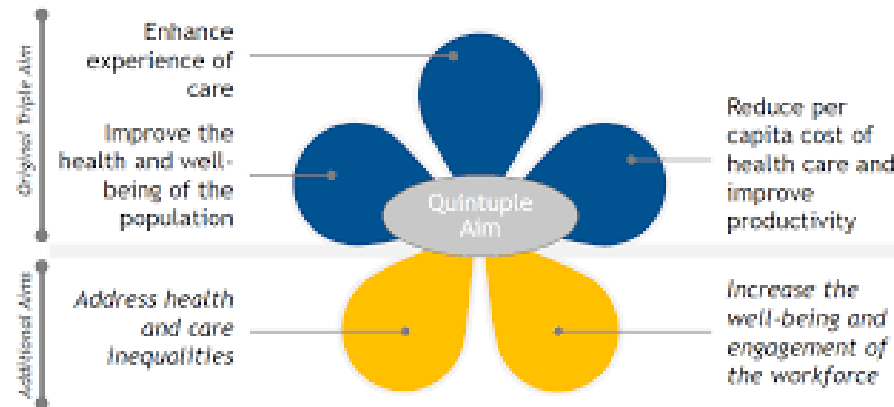
# Ethics: Decision Support Out

- Align to classic public/population health ethics
- Ethical Framework and Reflexivity Exercise for practitioners
- Key considerations:
  - Beneficence (do good)
  - Non-maleficence (do not harm)
  - Fairness
  - Autonomy
  - Utility
  - Transparency
  - Procedural justice



# Ethics: Posing an impactability question

- Context
  - The quintuple aim
  - Pandemic reset
  - Elective procedures waiting list
- How to prioritise and rationalise the delivery of services w.r.t.
  - Population need
  - Quintuple aim
  - COVID19 risk
    - Vaccines



# Questions

# Comments

The views expressed in this presentation are those of invited contributors and not necessarily those of the IFoA. The IFoA do not endorse any of the views stated, nor any claims or representations made in this presentation and accept no responsibility or liability to any person for loss or damage suffered as a consequence of their placing reliance upon any view, claim or representation made in this presentation.

The information and expressions of opinion contained in this publication are not intended to be a comprehensive study, nor to provide actuarial advice or advice of any nature and should not be treated as a substitute for specific advice concerning individual situations. On no account may any part of this presentation be reproduced without the written permission of the IFoA.



Institute  
and Faculty  
of Actuaries

# Contact details

- Alpesh Shah - [alpesh.shah@pwc.com](mailto:alpesh.shah@pwc.com)
- Lisa Morgan - [morgan@ilo.org](mailto:morgan@ilo.org)
- Dr. Chris Martin - [chris.martin@crystallise.com](mailto:chris.martin@crystallise.com)
- David Beddows - [david.beddows@optum.com](mailto:david.beddows@optum.com)
- Josephine Robertson - [josephine.robertson@optum.com](mailto:josephine.robertson@optum.com)

# Link to full report

- <https://www.actuaries.org.uk/news-and-insights/news/impactability-modelling-population-health-management>

