

Digital Health for the 21st Century: Technology working for patients & citizens



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From Newcastle. **For the world.**

Health inequalities exist in many difference guises

- Socio-economic
- Age-related
- Ethnicity
- Geographical



Designing, evaluating & deploying digital methods *effectively* requires *strong partnerships*

The Topol review & digital health

The review proposes **three principles** to support the deployment of digital healthcare technologies throughout the NHS:

1. Patients included as partners and informed about health technologies
2. The healthcare workforce needs expertise and guidance to evaluate new technologies, grounded in real-world evidence.
3. The gift of time: wherever possible the adoption of new technologies should enable staff to gain more time to care

And **four themes**:

1. Genomics



2. Digital medicine



3. AI & robotics

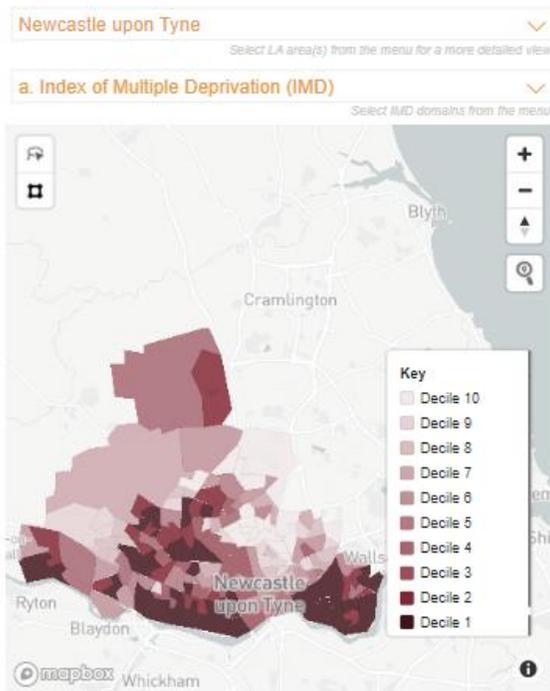


4. Organisational development



Data intelligence programme & health inequality

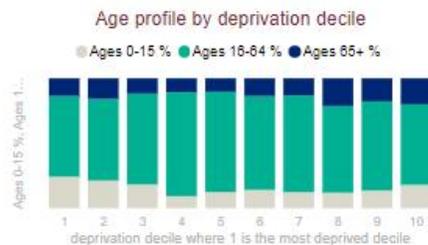
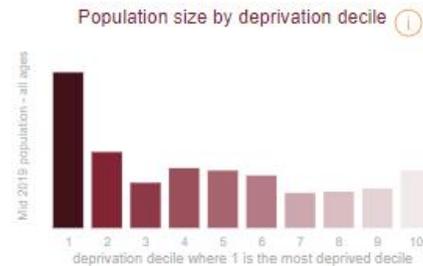
Duplication to Personalisation combines health & care data across two major NHS Hospital Trusts, Newcastle City Council, with the intelligence system enabled via Newcastle University’s National Innovation Centre-Data



The map displays which deprivation decile the neighbourhood (lower super output area) falls into nationally, the darker the red, the more deprived the area.

Deprivation

Index of multiple deprivation (IMD) 2019



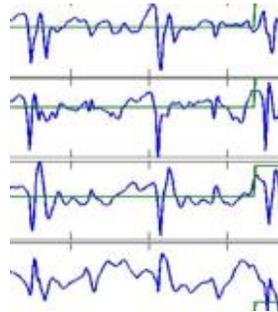
- 25% of residents live in the most deprived decile 1 & a further 12% in decile 2
- Core20 population is 37%
- D2P comprises a vast dataset (> 3 million “contacts” with 300,000 individuals over a rolling 2 year period)
- D2P aims to help partners reduce health inequalities & variation in care for targeted groups & individuals, whilst making better use of finite collective resources



How can we use wearable devices & mobile devices....

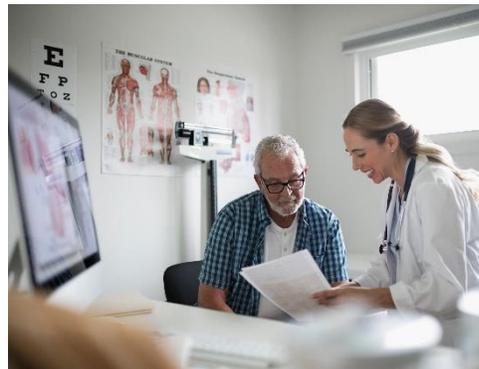
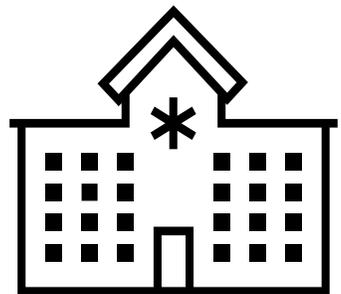
- To better detect, diagnose & monitor healthcare conditions and improve service efficiency
- Develop new convenient treatments & communicate changes in health conditions in a personalised manner
- Make sure that digital devices are fit for purpose, acceptable to all & feasible for use

“Care Everywhere”: Real world, digitally-enabled healthcare



Research Programmes

- Discover new digital tools to **measure & monitor health**
- Develop & test **digital healthcare treatments**
- Design & deliver **inclusive approaches**



Remote personalised digital tools to support diagnostics, monitoring & prognosis



Real-world - walking speed; turning; step count; walking bouts.....

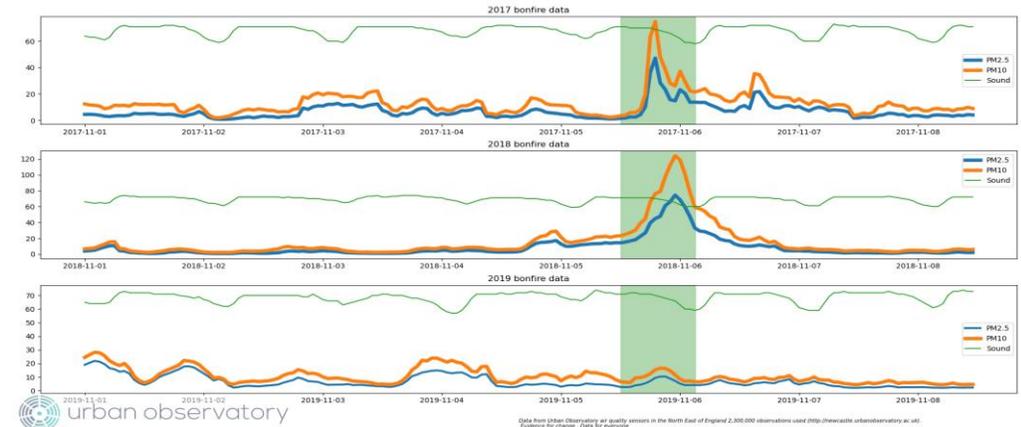
Exemplars of health & care benefit

1 Utilising meteorological, traffic data & digital twin representation to predict & intervene in respiratory & vascular events

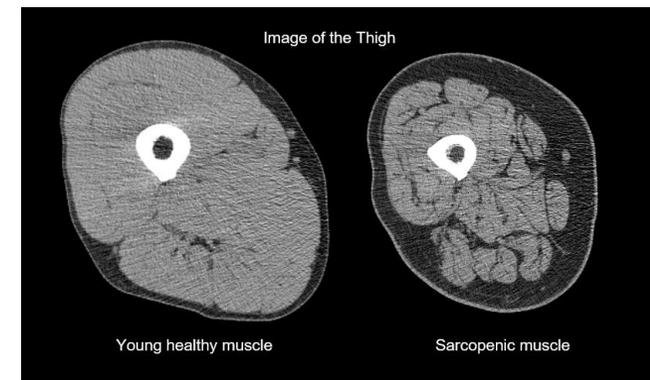


2 Deploying remote monitoring techniques to improve care in patients with rare disease

3 Combining remotely gathered data on lifestyle to personalise approaches to the management of sarcopenia (loss of muscle)

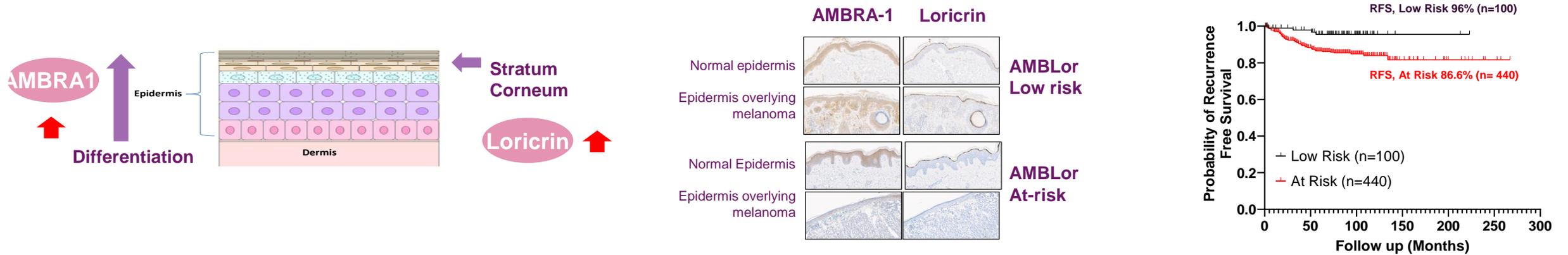


urban observatory
Analysis of air quality over consecutive bonfire nights across Tyne and Wear from UO monitoring stations

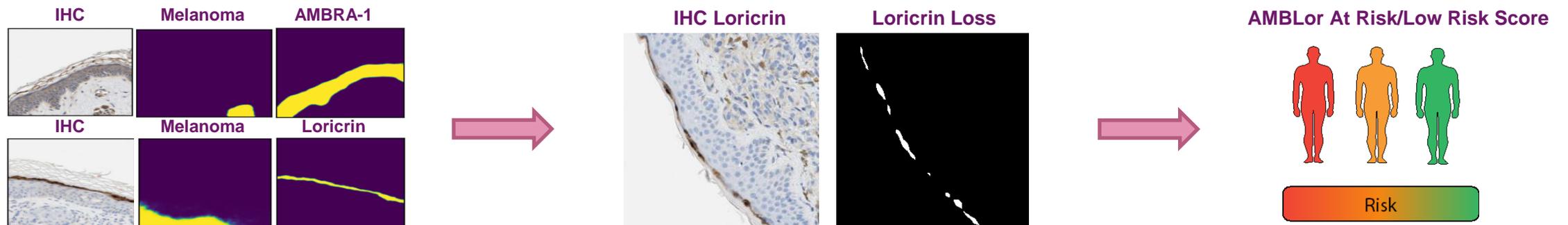


Evolution of AMBLor as a digital prognostic biomarker for early-stage non-ulcerated cutaneous melanoma

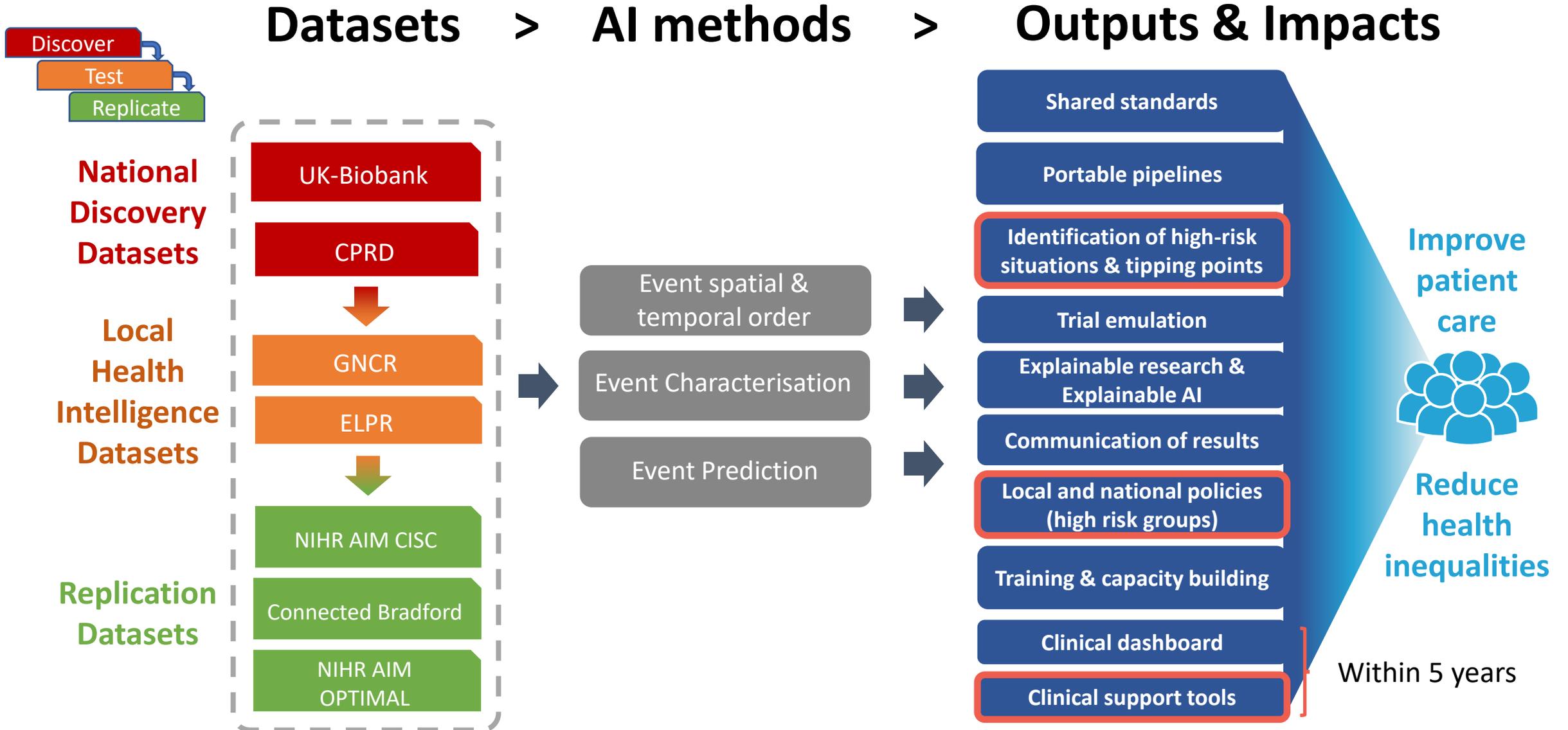
AMBLor as an immunohistochemical prognostic biomarker for early stage melanoma (AMLO Biosciences Ltd)



Deep Learning/AI interpretation of AMBLor (Mr Tom Andrew, NIHR ACF/PhD student)

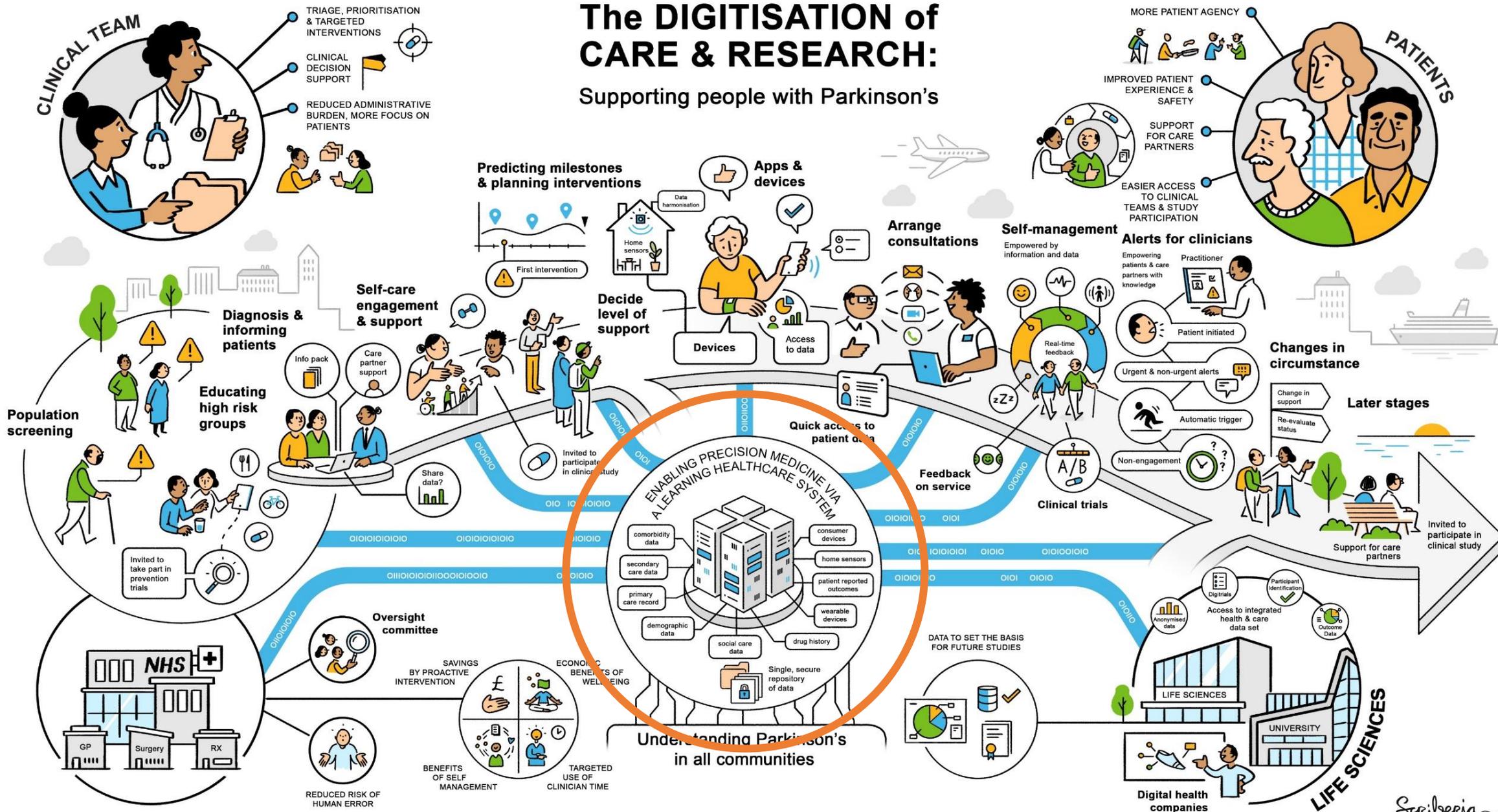


AI MULTIPLY

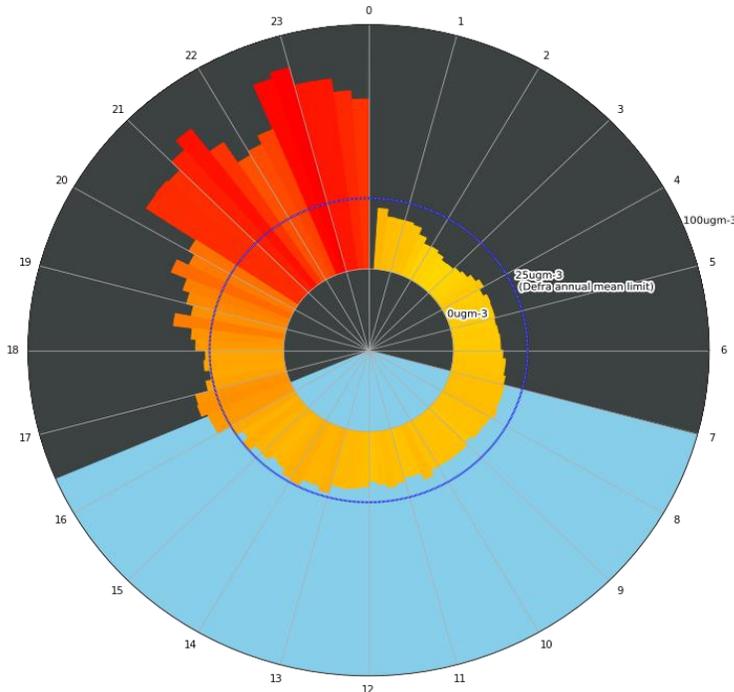


The DIGITISATION of CARE & RESEARCH:

Supporting people with Parkinson's

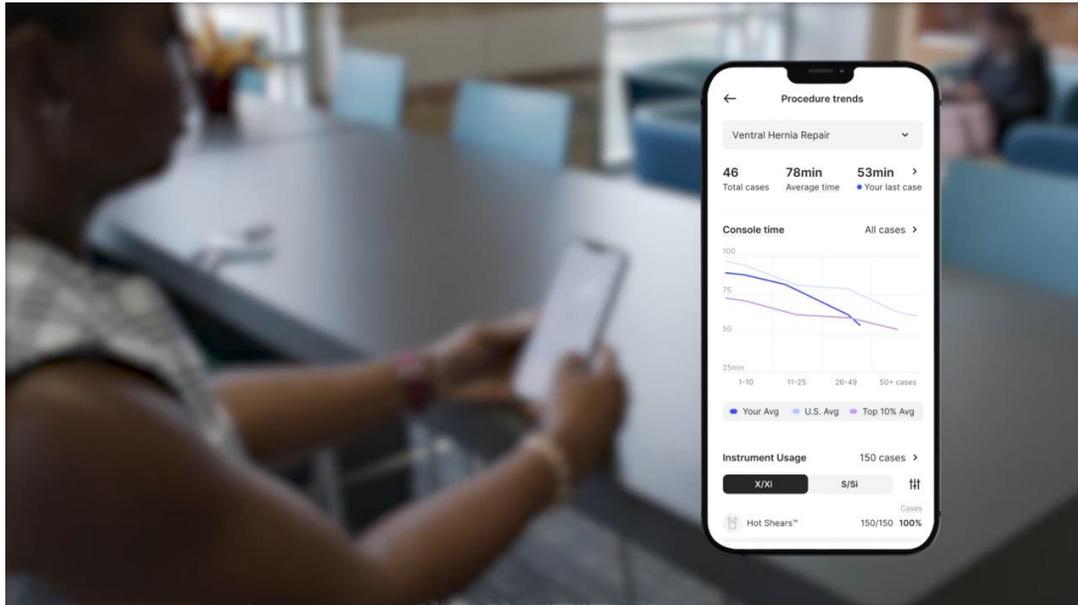


Developing capability & capacity



- The NIHR Newcastle Health Determinants Research Collaborative
 - creates new, specialist roles to support the council make best use of its data
 - engages in research & analysis to support improved outcomes for health & wellbeing
- Newcastle leads the MRC/NIHR co-ordinating hub for the National Rare Disease Platform bid
 - key role in education / training & novel method development
- We host the NIHR Research Support Service National Specialist Centre in Public Health
- Newcastle Urban Observatory
 - a BEIS/EPSRC funded facility that primarily deploys & curates data from urban sensors
 - >4000 active data streams managed in real-time & made available through the web & cloud for visualisation, onward processing or as archive datasets.

Newcastle Surgical Training Centre: leading the UK in robotic surgery training



Northern Health Futures

[NorthHFutures] Digital Health Hub

Academia / Health
& Care / Industry /
VCSE / Citizens

<https://northfutures.org>

Innovation ecosystem for

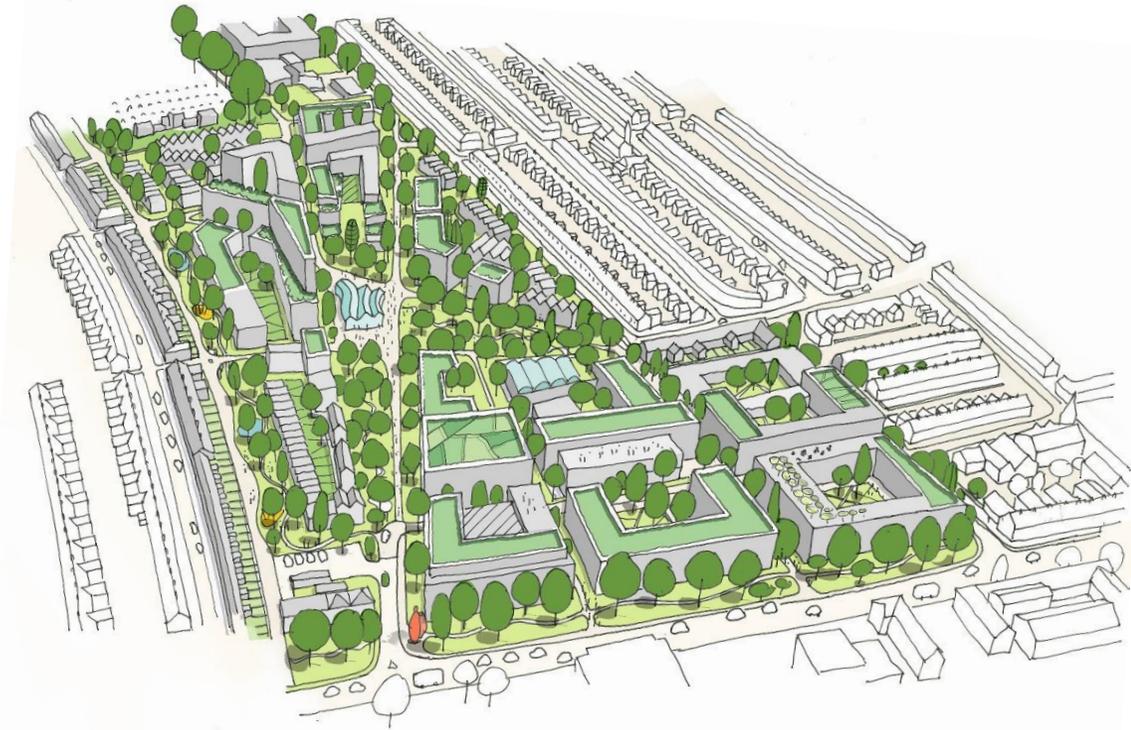
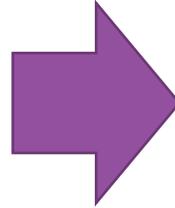
- research, development
 - and acceleration of
 - *responsibly designed,*
 - *human-centred, data-rich*
 - health-tech to cultivate
 - an entrepreneurial community and
- Meet health needs through collaboration***

NHS

**North East and
North Cumbria**

Health innovation neighbourhood

A digital health testbed



People first. Adaptive & varied. Green. Spacious.
Active

Health innovation neighbourhood: achieving the vision

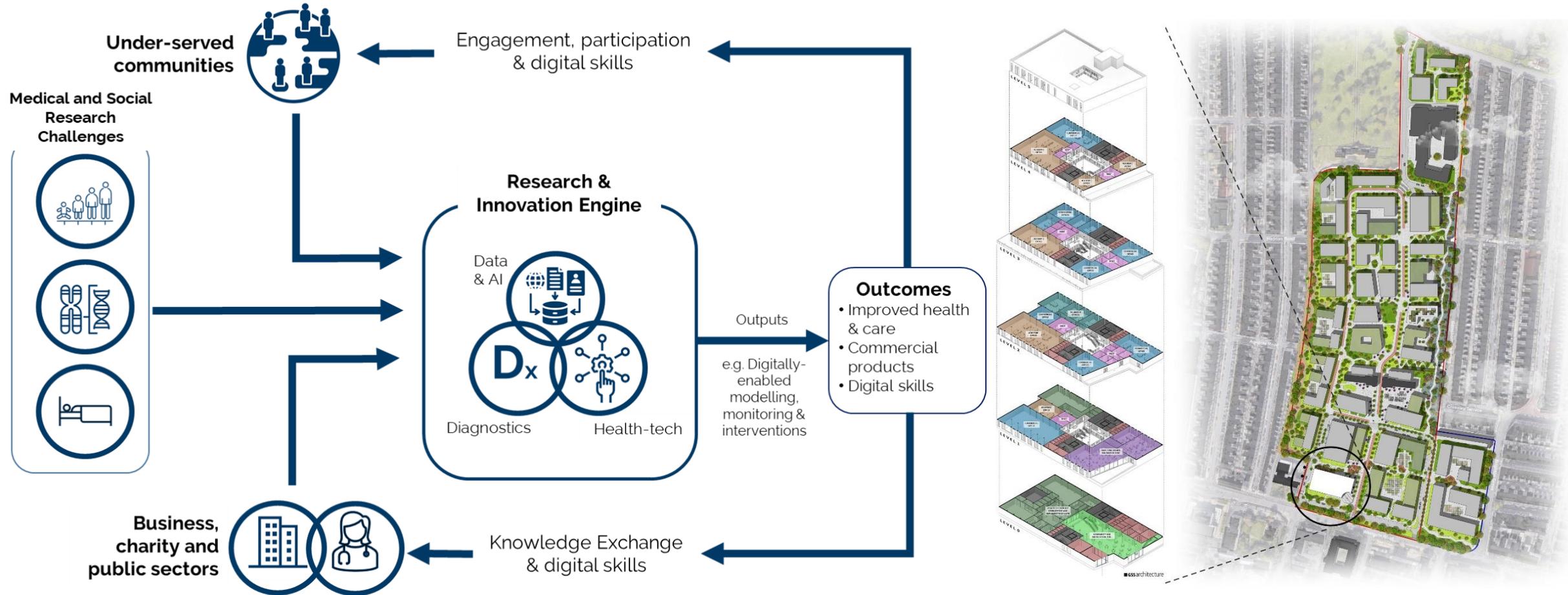
Leverage our considerable expertise in:

- Ageing & health
- Cities, places & sustainability
- Data
- Creative arts

To maximise both the environment on the neighbourhood for the community and its potential as a **living lab** to answer critical questions facing policy makers around the globe



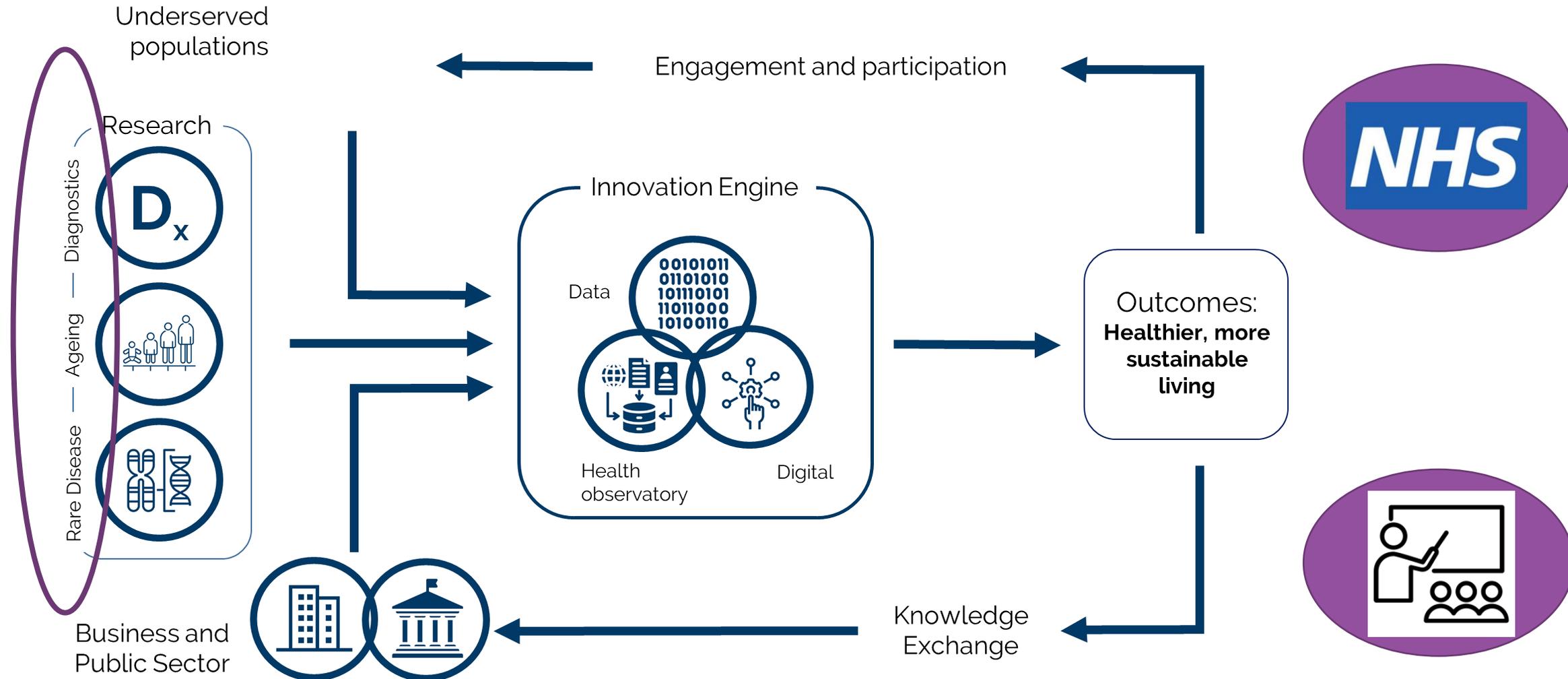
A hub for digitally enabled care everywhere (DigECarE)



Thank you: Questions?

Using digital health approaches to benefit our population

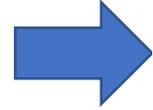
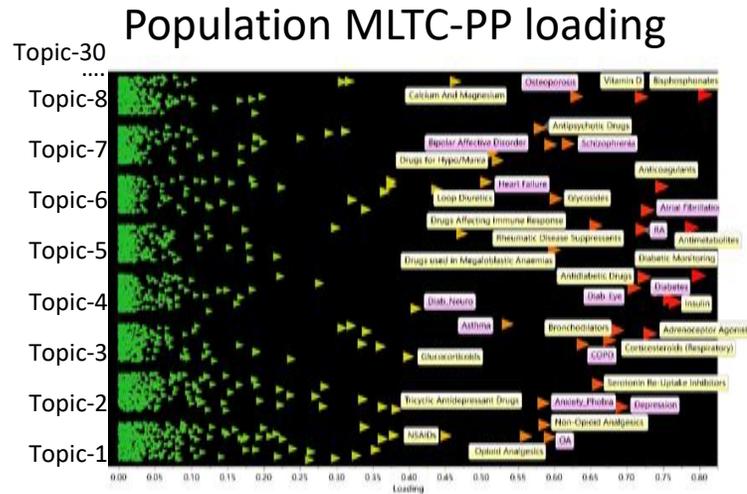
Underpinned by areas of research excellence & digital infrastructure “assets”



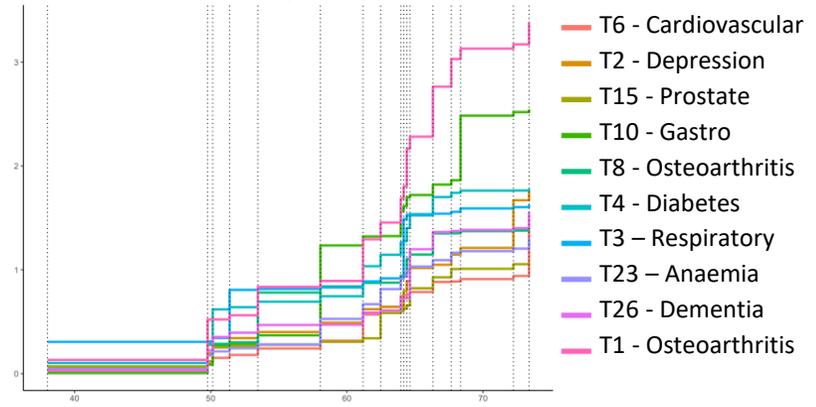
Monitoring patient journeys into MLTC-polypharmacy (PP)



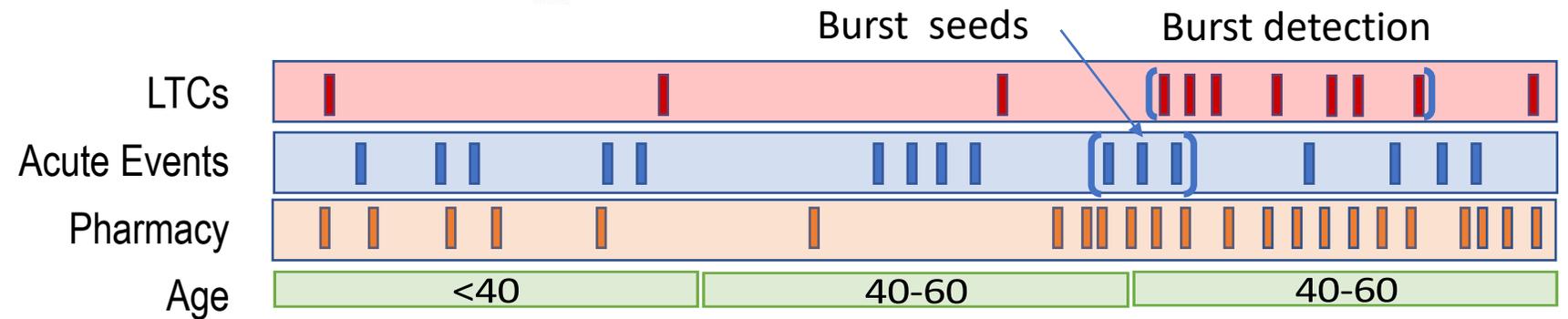
Assignable
Variation
Algorithm
(AVA)



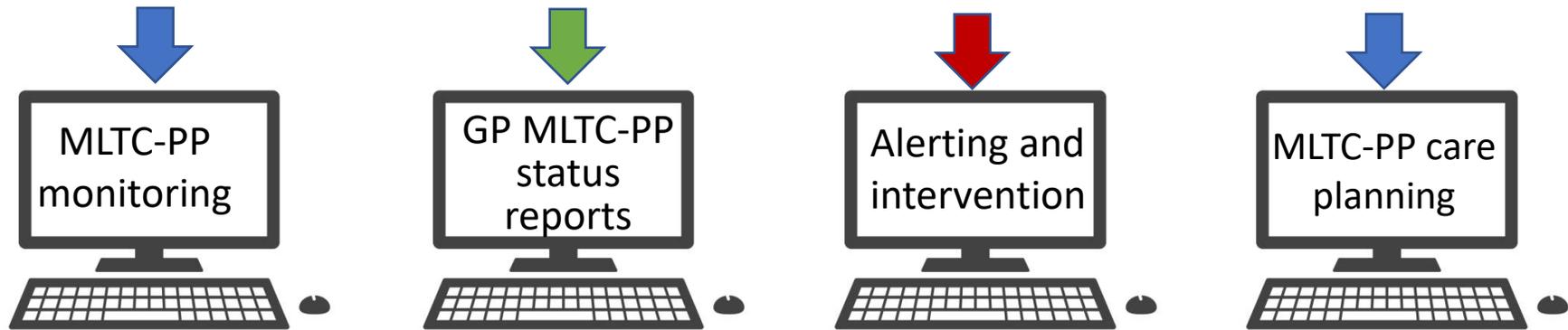
Individual MLTC-PP loading



From population
level to the
individual



Individual level
Burstiness
Crisis detection
Order of events



AI MULTIPLY

Clinical dashboards
GPs
Pharmacists