

CHIL

Civic Health Innovation Labs

A civic partnership advancing health, social and economic wellbeing together through system-wide data and health technology research and innovation

 www.liverpool.ac.uk/chil

 chil@liverpool.ac.uk

 [@LivUniCHIL](https://twitter.com/LivUniCHIL)



METROMAYOR
LIVERPOOL CITY REGION

*Tackling global health challenges
with civic data and innovation*



CHIL Civic Health
Innovation Labs

**Civic partnership of academia,
local government and NHS
mobilising data and technology
to tackle wicked problems
with and for our residents...**

Launched December 2023

"Collaboration within the research sector is essential if we want to tackle some of the largest health and care problems facing the world today, and centres like this make that a reality"

Professor Lucy Chappell
Chief Scientific Adviser to DHSC
and Chief Executive Officer of NIHR

Themes: global challenges; system data-action hungry

HEALTH & CARE SYSTEMS (*pressure-resilience, equity, life-course, population health...*)

[C-GULL](#), [PHIRST LiLaC](#), [Data into Action](#), [Round E're](#), [SysteMatic](#), [M-RIC](#), [HDRC](#), [GroundsWell](#), [ARC NW Coast](#)

MENTAL HEALTH (*connected: digital, comorbidities, community/systems...*)

[M-RIC](#), Data Action Accelerator, CHI-Zone, [4M](#)

INFECTION RESILIENCE (*antimicrobial resistance, pandemic preparedness...*)

AMR-X, Data Action Accelerator, [CAMO-Net](#), [FluVue](#), [Pandemic Institute](#), [BRIT](#), CHI-Zone, [HPRU GI](#)

MEDICINES OPTIMISATION (*safety, genomics, companion-AI, polypharmacy, multimorbidity...*)

[DynAIRx](#), OLS Data Action Accelerator, CHI-Zone, [M-RIC](#), [SysteMatic](#)

METHODS & INFRASTRUCTURE (*training, methodology, digital infrastructure...*)

[CDC](#), [M-RIC](#), [HOD2](#), ARISTOTELES, [CIPHA/SDE](#), Data Action Accelerator

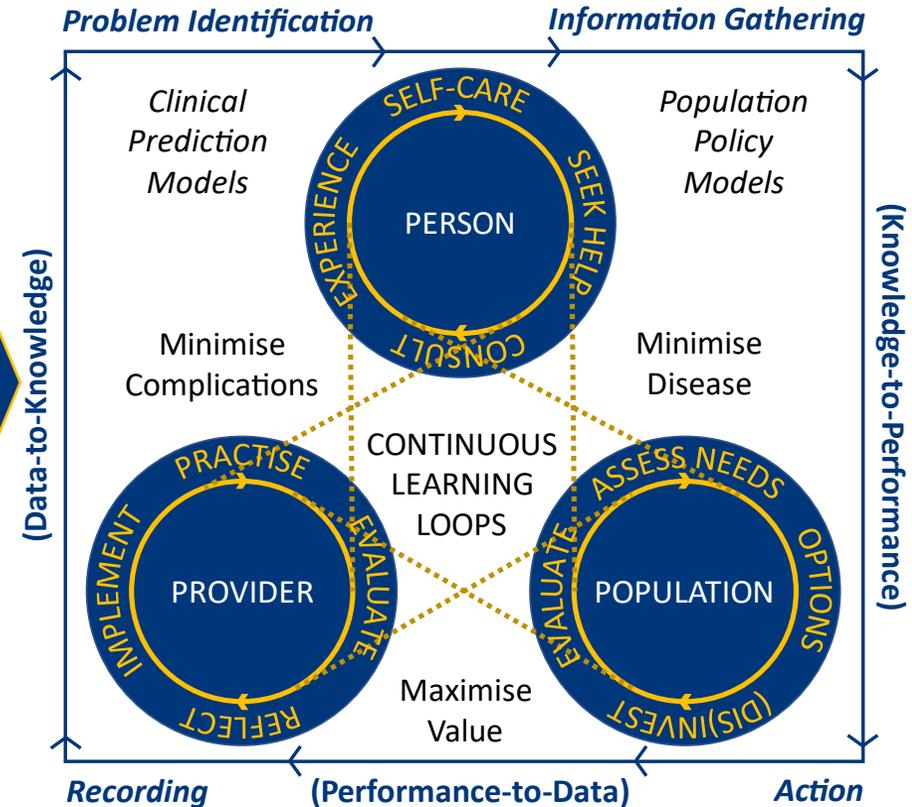
Optimising Healthcare Components vs Systems

Clinical Audit → Governance
(UK in 1980s/90s → 00s)

Learning Health Systems
(US rebranding in 2010s)

Health Systems
(Pop. Health Mgt. AI industry push 2020s)

- More people living longer with **multiple long-term conditions**
- Due to affect **68%** of **>65-year-olds** in UK by **2035** *
- Multi-condition pressures arise at **younger** ages in **deprived** areas
- Combined **mental-physical** problems more in **young** and **deprived**
- Existing **system pressures** higher in **deprived** areas
- Health and **social care** interdependency more in **deprived** areas
- Fewer resources for **prevention** accelerates **compound pressures**
- Climate/conflict/other **world pressures** denude available **funds**
- Population health management **AIs** trained/tested in **affluent** areas



Specialist registries/databases

Integrated clinical records

Wider civic (e.g. social care) data linkage

Crude predictive models
(baseline risk factor loaded)

Fuller longitudinal prediction
(difficulty learning models from data)

Multi-outcome prediction; complex interventions
(system dynamics; causal machine learning)

1-way translation
(trials evidence into practice)

2-way translation aim
(+ practice-based evidence)

**Reverse-engineering actions to tackle
escalating/compound pressures**

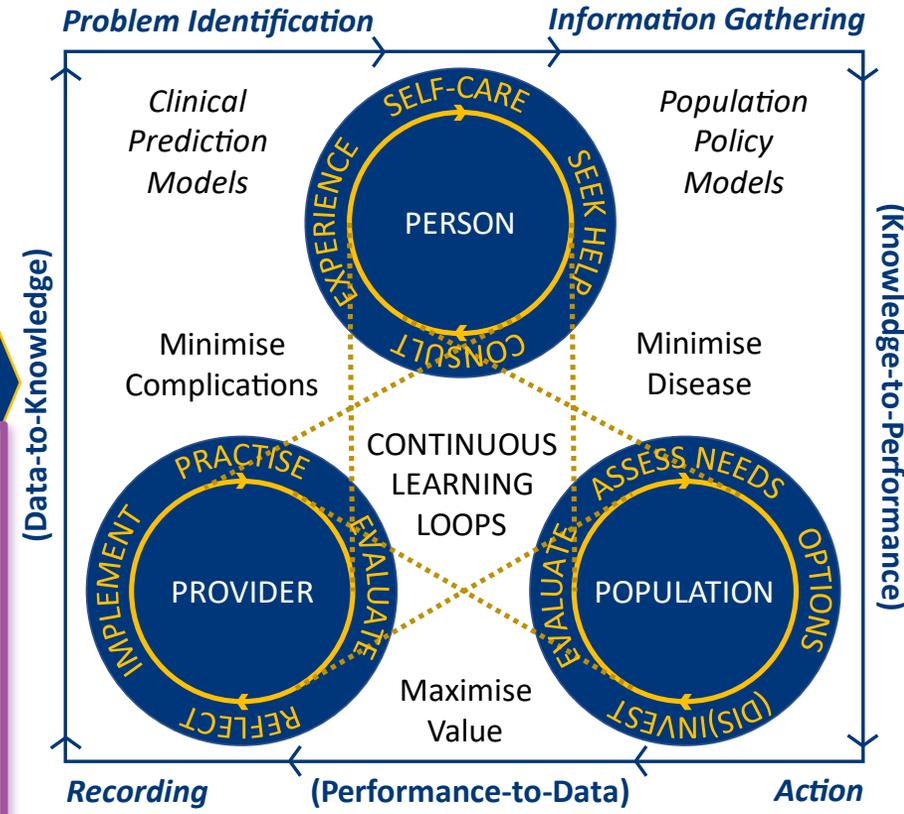
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Wider civic (e.g. social care) data linkage

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(system dynamics; causal machine learning)

**Reverse-engineering actions to tackle
escalating/compound pressures**

State of Health in the City: Liverpool 2040 from Liverpool's Director of Public Health...

- Unless changes are made, the city's residents are facing:
- spending **more than a quarter** of their life (26.1%) in ill health
 - a **fall in women's life expectancy** by one year and a **fall in women's healthy life expectancy** by four years
 - an increase of up to **38,000 more people living with major illness**, defined as at least two long-term conditions such as high blood pressure, cancer, diabetes, asthma and chronic kidney disease
 - **double** the number of adults experiencing **depression**
 - the health issues most common in **children** will be related to **mental health, obesity and child poverty**



Civic Family

- University-hosted collaborative **research centre** with **NHS-run** secure **data** facility
- Civic **purpose** to catalyse **health, social** and **economic** impacts
- We look **globally** to the **transferability** of the technical **solutions** we build



Civic Data Cooperative

Social License and Interdisciplinary Critical Mass to
Mobilise Data into Action, Systematically

SUPPORTED BY

NIHR

National Institute for
Health and Care Research



Cheshire and Merseyside



**LIVERPOOL
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Tackling global health challenges with civic data and innovation

Civic Data (& AI) Cooperative of Data Rightsholders



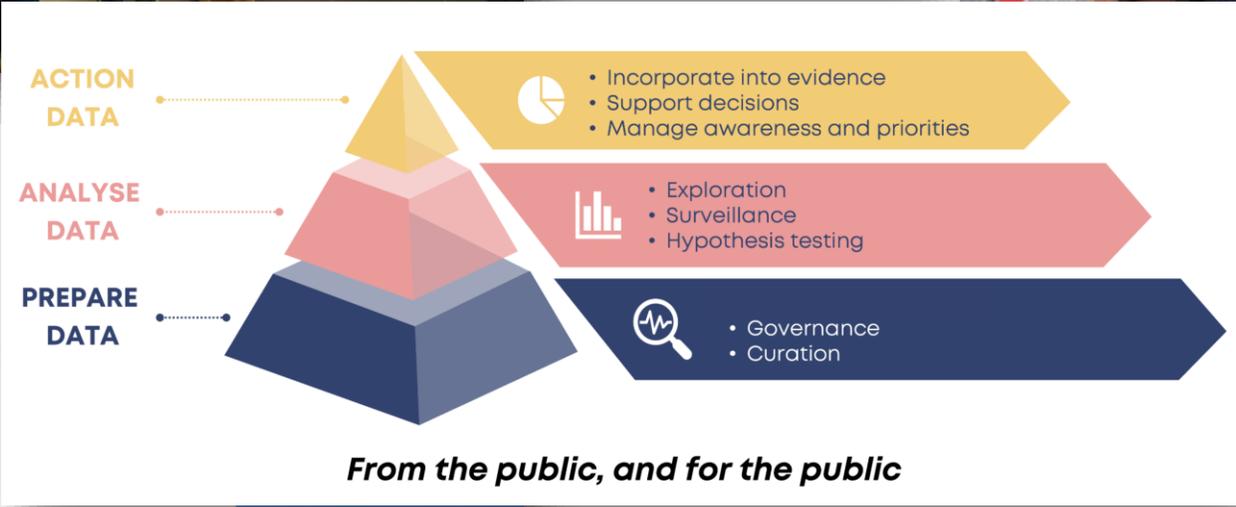
About Our Projects



Liverpool City Region Civic Data Cooperative

This Civic Data Cooperative has the potential to make a huge difference to the health and wellbeing of our city region, putting us at the forefront of a new sector that could generate significant numbers of high-quality jobs for local people.

– Metro Mayor, Steve Rotherham



CHIL Civic Health Innovation Labs



Round'Ere

What makes you well?

Building community-led wellbeing data hubs in Widnes UK

Team: Dr Emily Rempel, Emma Lord, Dr Gianfranco Polizzi and Professor Simeon Yates



"WIDNES HAS BEEN MIGHTY; WE'VE DONE GREAT THINGS."



Supported by:



delivered by:



Aim and Objectives

Build a community designed and governed wellbeing data hub using participatory research

1. Understanding what wellbeing means in Widnes
2. Imagining better solutions with data
3. Exploring this through the eyes of people who live in Widnes



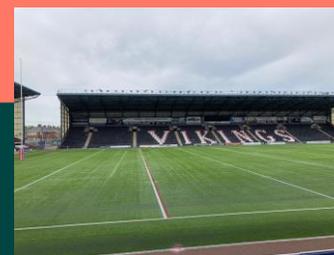
This project has been approved by the University of Liverpool Research Ethics Committee, approval number: 12124

What We Heard

- Hopeful community growth based in pride of the past
- A place where people are able to stay through all life stages
- Recognition in the role of agency in community opportunity and service provision



This project has been approved by the University of Liverpool Research Ethics Committee, approval number: 12124





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METRO MAYOR
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The key project aims:



Create space for a deep understanding of the challenge area, gathering intelligence on the wellbeing challenge as informed by sector experts.



Create and connect a network of brilliant people with ideas about how to solve the issues in this space.



Support this network to develop a viable and scalable solution for LCR that can tackle the challenges in Mental health

Participants are invited to a series of events which create space to pick apart the problems, gather people around them and light the spark for ideas that create new possibilities.

2022-2023:

Our big 3 problems were:



Reducing Childhood Asthma through better environments and awareness



Increasing family support to stop children entering the care system



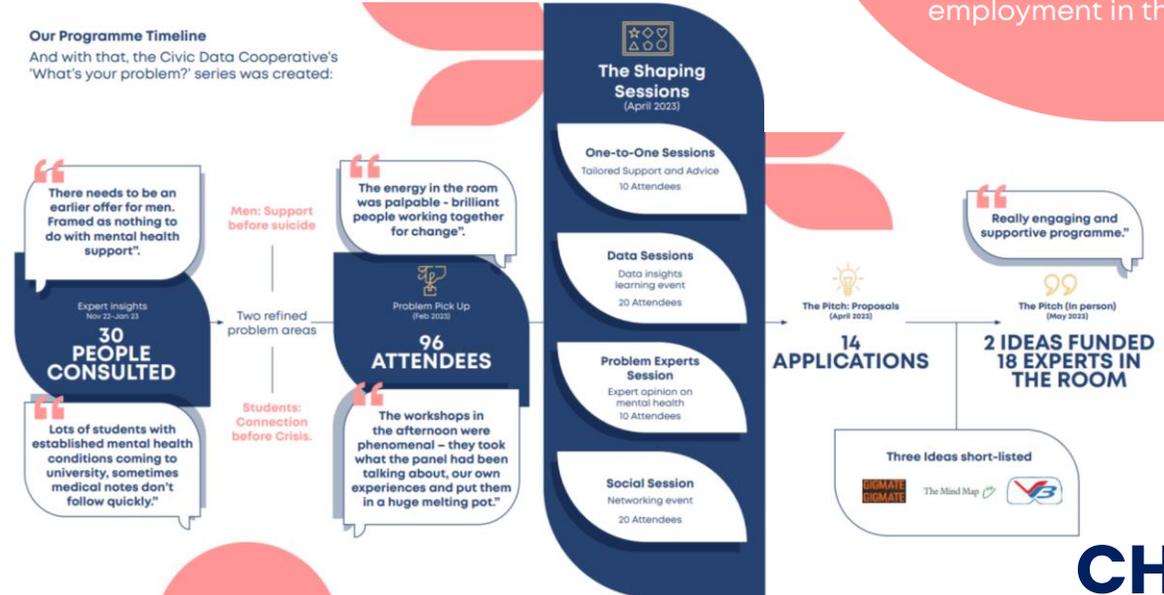
Making digital feel doable in local authority social care teams

2023-2024

Focussed on men at risk of suicide and isolation in students

Our Programme Timeline

And with that, the Civic Data Cooperative's 'What's your problem?' series was created:



Let's look at the context

What's Your Problem 2023 is part of the wider strategic vision and aims of both CDC and LCR Combined Authority contributing towards:

Positioning CDC as connector and creator around using data to transform how we support communities.

Understanding what data and insights tell us and how these can be applied to affect change.

Influencing key stakeholders about using this way of working when designing services.

Engaging with SMEs across the region and, ultimately, increasing employment in the longer term.

Civic Public Support to Bridge the Data-Action Gap

2016 & 2022: Regional citizens' juries asked, "should the NHS be allowed to create anonymised copies of patient records for secondary use?" saw major shifts from opt-in to opt-out consent



“ Having listened to a number of presentations from esteemed professionals, we have collaborated as a 'Jury' to express our views on proposals to use and share personal data for the purposes of addressing this important area of public health. Put simply, it is to try and find solutions to the fact that antibiotics are becoming less effective and we need to research, fund and find new treatments and drugs for the benefit of us all. Our findings will help shape policy to address these issues. ”

Quote from Jury member

2016 & 2022: Public discontent with national data-sharing initiatives, which is seldom seen locally; and patients now expect data-driven services



Controversial £360m NHS England data platform 'lined up' for Trump backer's firm

Patients will have no say over records going to Palantir, the software giant run by billionaire Republican backer





GP, Social Care Sources



Hospital Sources



Community, Public Health Sources



Patient Sources

CIVIC DATA COOPERATIVE

TRUSTWORTHY LINKAGE, PSEUDONYMISATION, CODE EXECUTION

Health system 1...

Provider
Data Processing



Integrated Care System

Data Processing
Linked
Pseudonymised
Part-curated data



National Data Service

Trusted Third Party
❖ Key management
❖ Deidentification
❖ Reidentification

Approved Tools for
Dataset production
Data curation
Analysis & Simulation

Actionable Analytic/Trustworthy Research/Secure Data Environment (TRE/SDE) in national grid / federation

Dataset Extraction and Curation Pipeline
Audited Execution of Code on Data
Population Health Management Linked to Care Workflow



SDE Network

API

COMMONS

Data Catalogue
Analytic Code Books
Algorithm Library
Terminology Services
Metadata Resources
Federated Analytics

APPROACH

Open Standards
Open Development
Open Assurance
Open Maintenance
Open Innovation

COMMUNITY

Dashboard exchange
Analytic load-balancing
Shared learning resources
Predictive cooperative



OVERSIGHT

Strategic Data Insights
Steering Group

Role-based
Access



CIVIC GOVERNANCE

Efficiently considering data access requests, processing agreements and monitoring data quality, curation and transferable value from innovative data processing – while driving patient, practitioner and public involvement within a region health system ‘diameter of trust & actionability’



GOVERNED EXECUTION



OPEN DISCOVERY
OPEN IMPACT

Mobilising data into action...

Spring 2019

Public Support for Data Uses

CivicDataCooperative.com

Summer 2020

Covid-19 intelligence system in 90 days for 2.7m population

CIPHA.nhs.uk

Autumn 2020

World-first voluntary mass testing

Covid-SMART

Spring 2021

First reopening of mass events

First Dance

Winter 2022

Mental Health Mission

M-RIC

Winter 2023 / Spring 2024

Research Centre, Birth Cohort, NHS Data-into-Action

- [Ainsworth J, Buchan I. Combining Health Data Uses to Ignite Health System Learning. Methods Inf Med. 2015;54\(6\):479-87](#)
- [Buchan I, National Grid of Civic Data Cooperatives for Health in The Health of the Nation February 2020](#)
- www.liverpool.ac.uk/coronavirus/research-and-analysis/covid-smart-pilot/

Programmable Equity

Data into System-wide Actions to Tackle Inequalities as
an Equity Learning System, Improving Continuously

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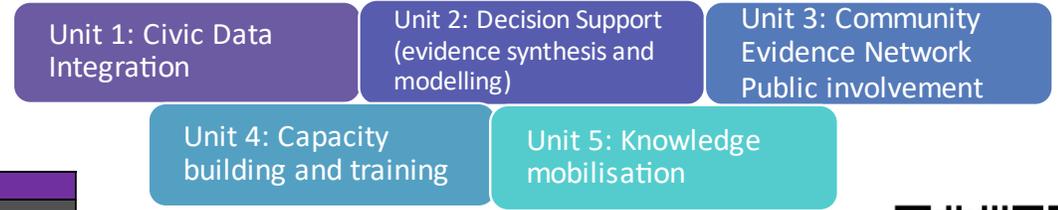


Tackling global health challenges with civic data and innovation

NIHR Health Determinants Research Collaboration Liverpool

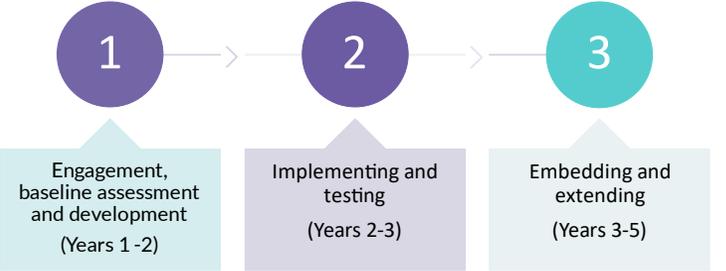
Focus on wider determinants: the conditions in which we live, work and play, which have a huge influence on our health and wellbeing, including:

- employment and working conditions
- housing and homelessness
- income
- air and water pollution
- food security and diet
- access to green and blue space
- transport methods
- social inclusion
- climate change



- Liverpool City Council is the programme lead
- Taking a collaborative approach : LCC in partnership with the University of Liverpool, Liverpool John Moores University, Liverpool CVS and Healthwatch Liverpool
- A strong focus on co-designing, co-delivering, and co-disseminating research in partnership with our communities.
- £5 million over 5 years commencing from January 2024
- NOT** research funding (funds capacity and capability to enable research funding to be sought)
- A transformational change programme – aim: to change the culture of LCC and embed evidence informed decision making
- To build evidence base on wider determinants of health with overall aim of improving health outcomes and reduce health inequalities

A TRANSFORMATIONAL CHANGE PROGRAMME					
VISION					
We will boost research capacity and capability within Liverpool City Council and embed a culture of always using evidence when making decisions. This will make Liverpool a world leading centre for research and innovation in tackling the causes of poor health outcomes and reducing health inequalities.					
AIMS					
Build research capacity and capability within Liverpool City Council	Develop a culture of evidence-informed decision making within Liverpool City Council	Develop stronger research collaborations across the council, universities, and voluntary, community, faith, and social enterprise (VCFSE) sector	Involve and empower local communities through the co-design, co-delivery, and co-dissemination of health determinants research	Increase the amount of investment in Liverpool in relation to determinants of health research	Disseminate learning locally, regionally, nationally and influence policy making
PRIORITY AREAS (ALIGNED TO COUNCIL PLAN)					
A strong and fair economy for all	High quality and inclusive education, skills and employment	Thriving communities	Healthier lives for children and adults	A well connected, sustainable and accessible city	A well-run council
PRINCIPLES					
Co-production: with organisations and our local communities as equal partners Promote equality, diversity, and inclusion Social Justice: Focus on the social determinants of health and reducing health inequalities Be brave and innovative					



January 2024 to December 2029





Partners and Stakeholders

- Liverpool City Council
- ICB
- Primary Care Networks
- Community Organisations
- Community Champions
- Volunteers
- Secondary Care (Mersey Care)
- Nurseries, Schools, Family Hubs & Children's Centres
- Freelance Creatives and Artists



HELP Project tackling avoidable & unfair differences in health

- LSTM led project
- 4 Primary Care Networks (PCNs) working together with wider community stakeholders addressing low uptake of:
 - Childhood immunisation (MMR)
 - Cancer screening (breast & cervical)
- Research component
 - Sustainability of our community led model



Award Winning Project



LCR Culture & Creativity Awards 2024: Winner of Health & Wellbeing Category

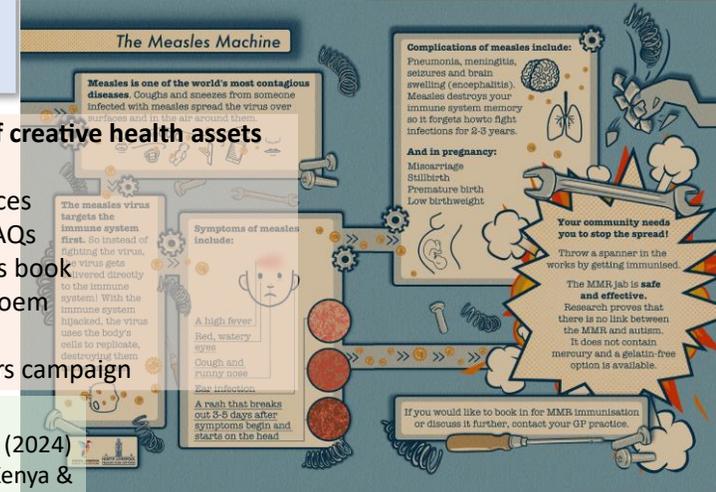
- Recognised for national influence by Head of UKHSA for national MMR campaign
- Official Selection in the WHO Health for All Film Festival - "Four X-rays could save your life"

Co-development of creative health assets

- Educational Resources
- Visually engaging FAQs
- Illustrated children's book
- Mammogram bra poem
- Branding
- Benevolent Rumours campaign

Extending our Work

- Exchange programme (2024) between Homa Bay, Kenya & Liverpool to strengthen the community health workforce
- ReCITE (2024-27): research programme using the power of storytelling to tackle health equity



Outreach and events

- PCN engagement event
- Training/formation of community innovation teams – data analysis & quality improvement
- Creatives marketplace
- >30 community engagement events
- Personalised cervical screening clinics
- School coffee mornings
- Further spin off community events





CHILDREN GROWING UP in Liverpool

- FIRST DEDICATED BIRTH COHORT in Liverpool
- Targets high infant mortality, low healthy life expectancy, poor mental health
- 4M : Milk, Microbiome, Mental Health and Me
- Nested in region-wide linked data system to follow the digital twin of the child's journey



Liverpool mum signs up to major city birth study to help create better future for generations of children

theguideliverpool.com

UNIVERSITY OF LIVERPOOL



NHS
Liverpool Women's
NHS Foundation Trust



NIHR | Clinical Research Network
North West Coast

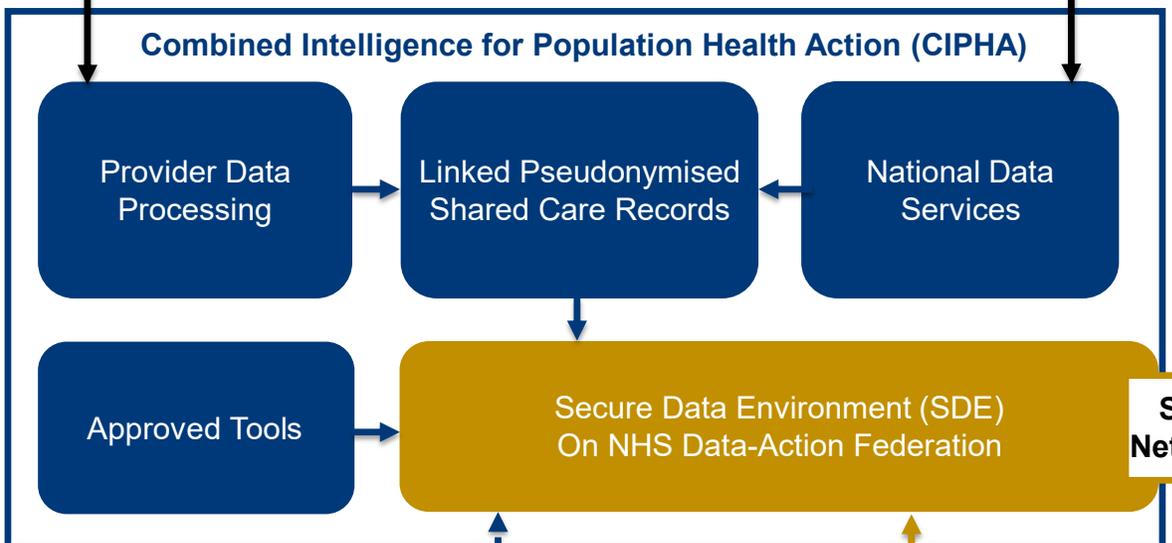
347 women
so far

96 Partners

163 babies
born

5 Twins

<https://www.bbc.co.uk/news/uk-england-merseyside-68735094>

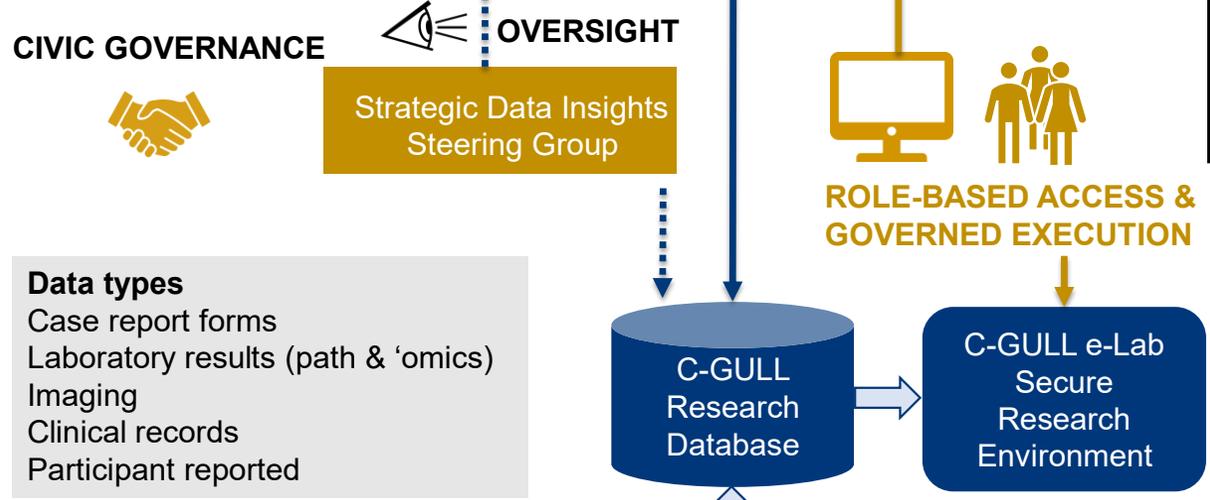


COMMONS
 Data Catalogue
 Analytic Code Books
 Algorithm Library
 Terminology Services
 Metadata Resources
 Federated Analytics

OPEN APPROACH
 Open Standards
 Open Development
 Open Assurance
 Open Maintenance
 Open Innovation

ACTION COMMUNITY
 Analytic load-balancing
 Shared resources

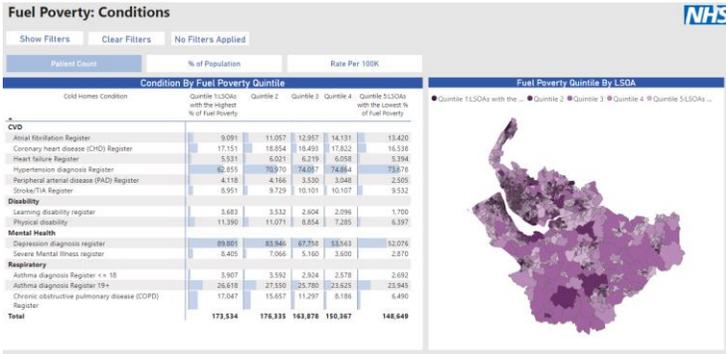
- Longitudinal birth cohort study
- Focus: trajectories of inequality
- First pregnancy
- Triad design
- 10,000 babies
- 30,000 residents
- Linked longitudinal real-world data
- Instrument e.g. toxic stress
- 'City Lab' ← www.cipha.nhs.uk (SDE)
- 10,000 digital twins growing up
- Child-friendly city & (civic) AI
- Multi-modal data sources



FAIR Resources
 Data catalogue
 Code (GitHub)
 Metadata interoperable with other cohorts'
 e-Labs

Integrated Care Board Data into Action Programme Examples

Fuel Poverty



Challenge

How to **identify vulnerable patients** who are most at risk of 'cold homes' due to the fuel poverty crisis.

Data

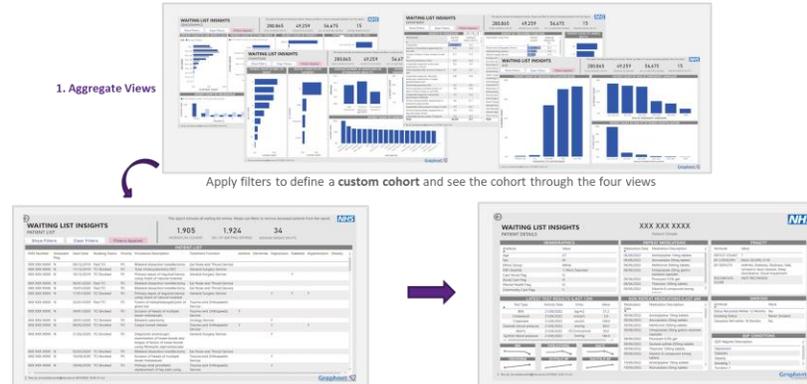
Developed the Fuel Poverty dashboard to enable segmentation/ stratification of patients at risk of a 'cold home' (NICE definition).

Available in identifiable format for direct care

Action

Used by GPs & respiratory teams to contact patients at greatest risk. Referrals to health and social care services.

Elective Recovery



Challenge

Creating a **system view of patients waiting for elective treatment** to understand if there is equity in access and waiting times, to support more effective prioritisation.

Data

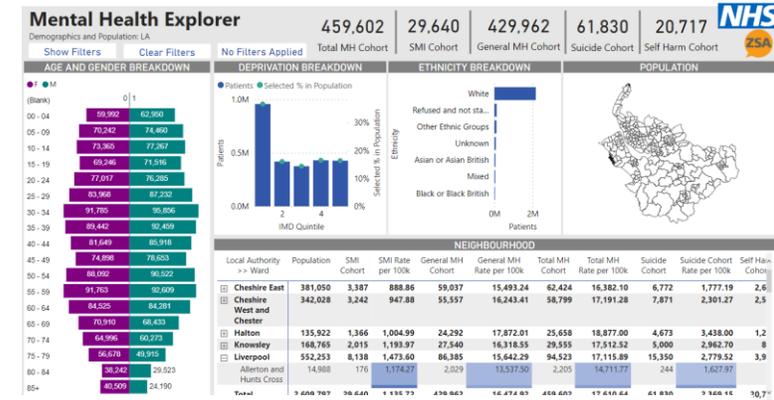
Developed the Waiting List Insights dashboard that enables segmentation/ stratification of patients with ability to drill down to patient level.

Available in identifiable format for direct care

Action

Used by providers, elective recovery & health inequalities teams to identify high risk patients and inform strategic direction.

Mental Health



Challenge

Understanding the **prevalence, demographic insights and epidemiological make up** of mental health cohorts.

Data

Developed the Mental Health Explorer dashboard that visualises the demographic insights and comorbidity profile for patients diagnosed with mental health conditions.

Action

Used by mental health services to inform strategy and mitigate health inequalities relating to service access and use.

Population Explorer Tool

Demographics

2,435,886

TOTAL POPULATION

7,063

SELECTED POPULATION

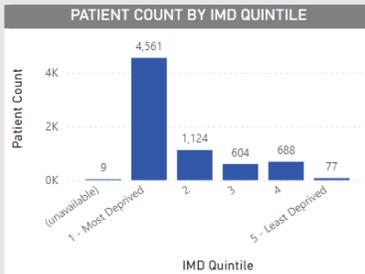
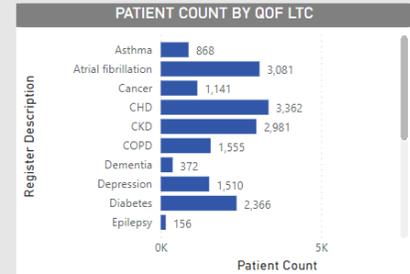
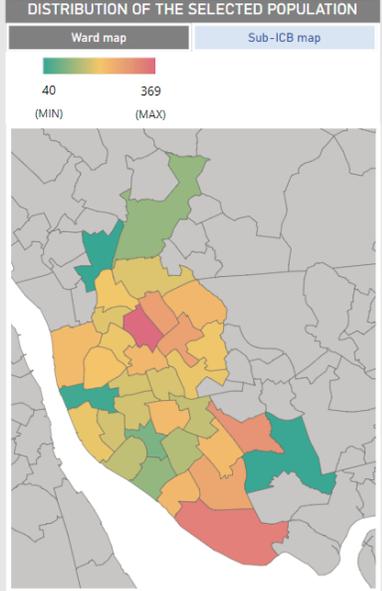
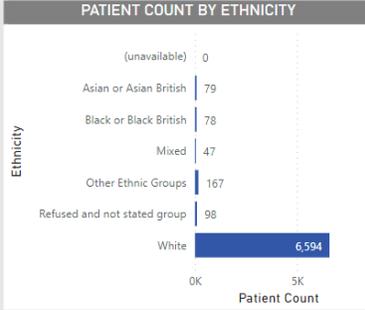
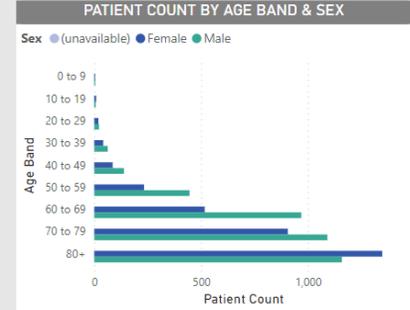
0.29%

% OF POPULATION



Show Filters Clear Filters Filters Applied

Show patient count view Show % view Show rate per 100k view



Run by: Andrea.Astbury@cheshireandmerseyside.nhs.uk on 23/10/2023 11:23 | V2.2.0 | Data last refreshed: 22/10/2023 13:04

Graphnet Transforming Care

Enhanced Case Finding GP-led System-wide Actions



Telehealth

Supporting people to stay well at home, regularly checking key observations, supported by clinicians when required

- 1 Aged 18 +
- 2 COPD, Diabetes, HF
- 3 37% + Admission Risk 12 mths



ICTs (Phase 1)

Co-ordinated care around the individual where they have a range of issues including broader determinant factors

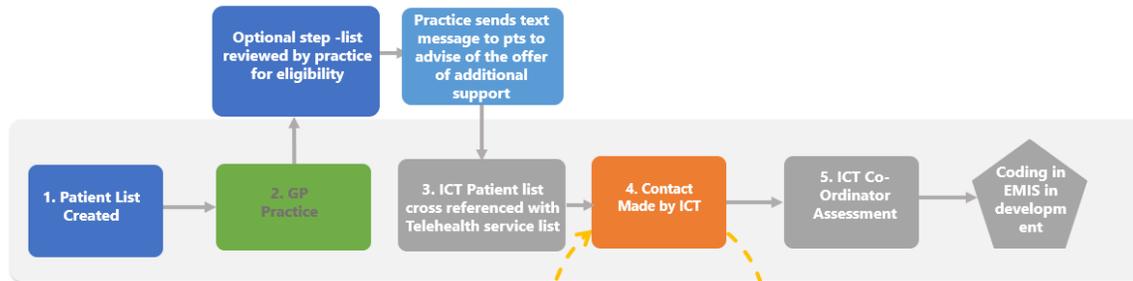
- 1 Aged 65+ & IMD 1
- 2 F&D & 3+ LTCS
- 3 High GP & A&E usage
- 4 50% + Admission Risk 6 mths



Multimorbidity MDT

Supporting people with a range of complex and interdependent long-term conditions which require cross-specialty management

- 1 Aged 50+
- 2 5+ LTCS
- 3 5 + outpatients & 2+ A&E
- 4 High Usage of GPs
- 5 70 % Admission Risk 6 mths



List of patients eligible for both Telehealth and ICTs is searched for on the patient identifiable Case Finding Tool. Initial list ran for 3 month ahead (prevents the list changing too frequently).
Telehealth & ICT - allocate to the right ICT Co-Ordinator. Clinical leads will review referrals to identify additional needs.
Patients can choose to opt out when contacted by the service

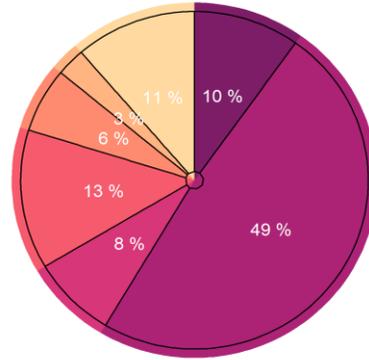
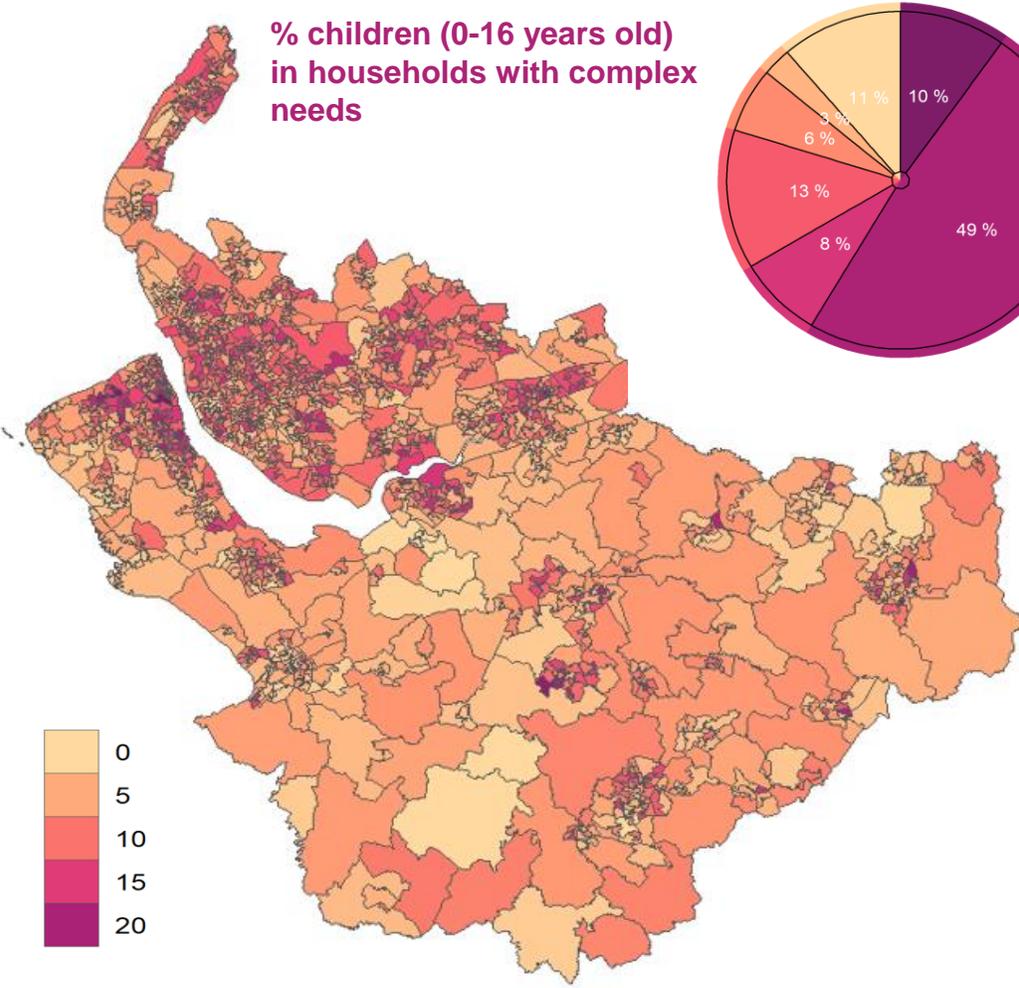
Check which services pt already under

Weekly validation process between ICT, Telehealth and any future services who may come on board to do proactive searches e.g. LDP and CRT - need to have definitive lists to avoid duplication and over contacting people. Referrals between these services will be managed and integrated solutions developed where appropriate



Identifying Households with Children with the Most Complex Needs

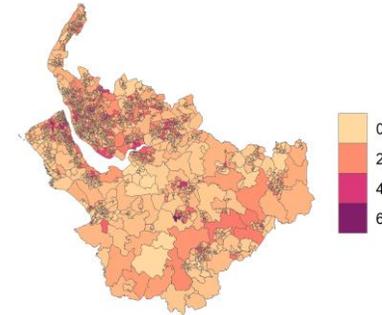
% children (0-16 years old) in households with complex needs



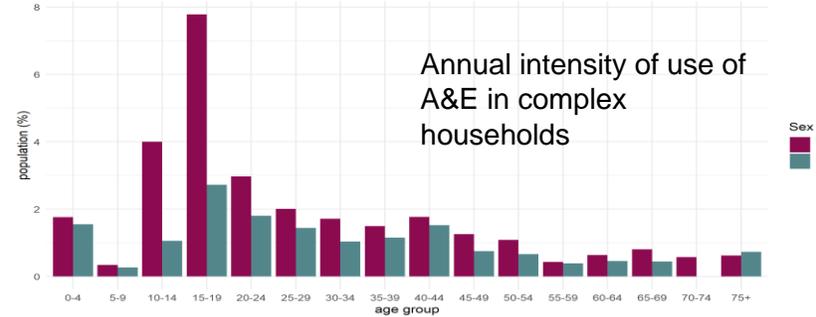
Total health and care spend distribution



Number of complex needs households

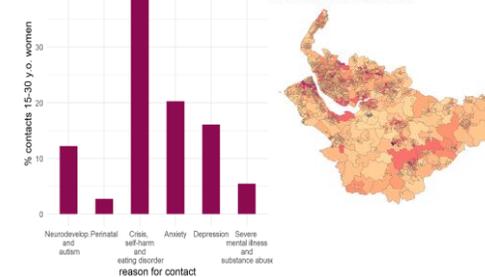


People attending A&E because of mental health problems

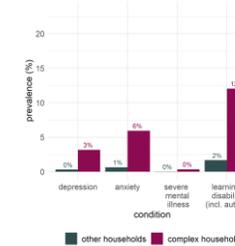


Annual intensity of use of A&E in complex households

% of young girls and women (15-30) with mental health problems



Children



- Innovative population segmentation model that supports active implementation of integrated services
- Uses system-wide pseudonymised individual and residential linked data from health and social care
- Deep-dive into descriptors of needs and service use at different resolutions
- Comparisons between population segments to identify inequalities and gaps
- Used in several local authorities to plan for families and children services

System P



Cheshire and Merseyside



Mersey Care
NHS Foundation Trust



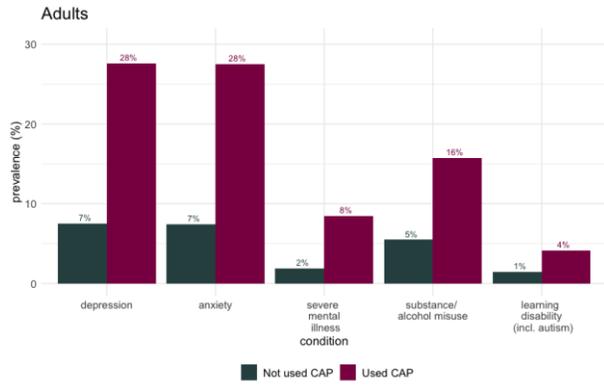
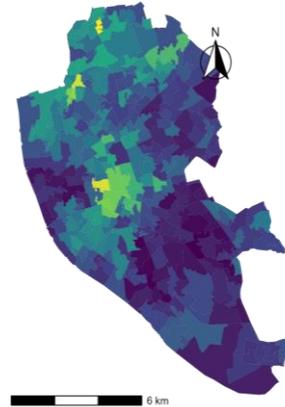
Citizens Advice on Prescription Does it improve mental health?



Large number of high need patients seen

- 65,000 people between 2018 and 2022
- 70% living in poverty
- 40% with at least 1 mental health problem
- 60% with multimorbidity
- Average 30 GP consultations per 100 clients in the 3 months before intervention

Number of people / 1000 population - 2022



Cost per client was £141

Patient reported outcomes:
EQ-5D, SWEMWBS



- Reduced anxiety and depression
- Improved wellbeing

Impacts

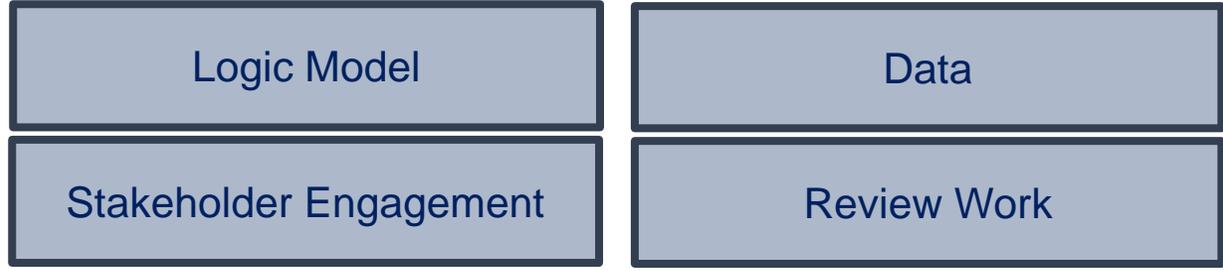
- Reduction in Antidepressant prescribing by 73 ADQs per person per quarter (95% CI 25-121)
- 7 fewer A&E attendances per 100 clients per quarter (2-11)

Return on investment:
For every £1 invested in the CAP service, £6.50 of value was generated

Economies for Healthier Lives

Improving employment outcomes in Liverpool City Region

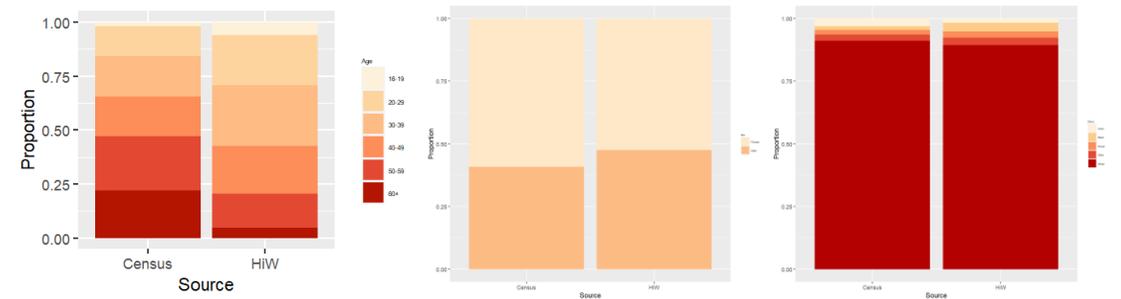
Aim: better link the aims of employment support and public health across LCR, leading to a coordinated approach allowing the economy to adapt to the health needs of our population and promote good health



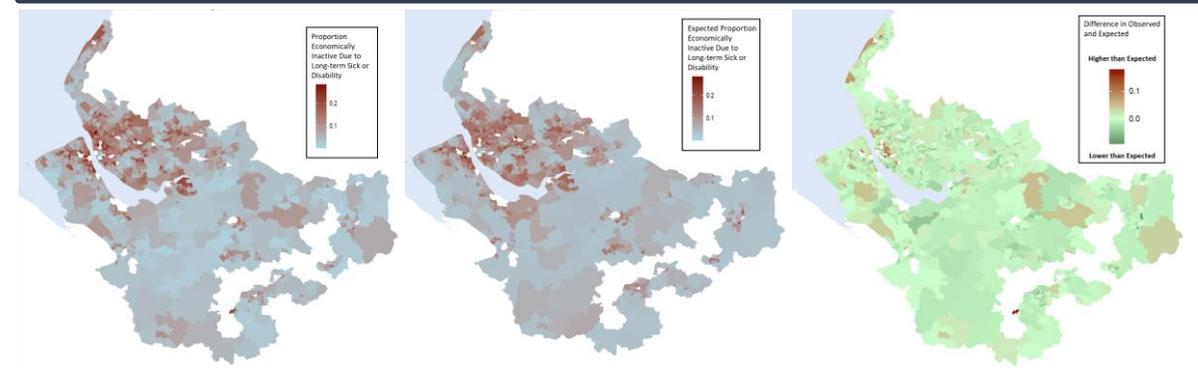
Service Redesign and Improvements
Utilise learning from each area of work to identify recommendations to improve the service offer and better meet population needs

Economy and Health Integration Toolkit

Equity Audit
Compare the demographic breakdown of clients with census



Area Profiles
Observed *Expected* *Difference*



Multimorbidity & Medicines

Data into Optimisation of Pathways and Medicines
to Address Multimorbidity and Overprescribing

SUPPORTED BY

NIHR

National Institute for
Health and Care Research

NHS

Liverpool University Hospitals
NHS Foundation Trust



UK Health
Security
Agency



**LIVERPOOL
CITY REGION**
COMBINED AUTHORITY

METROMAYOR
LIVERPOOL CITY REGION



Liverpool
City Council

Tackling global health challenges with civic data and innovation

Anticholinergic Medications Index - ACMI

Anticholinergic medications (ACM): broad group used for several conditions. Painkillers, antidepressants, heart medications, stroke medications, antipsychotics, antihistamines

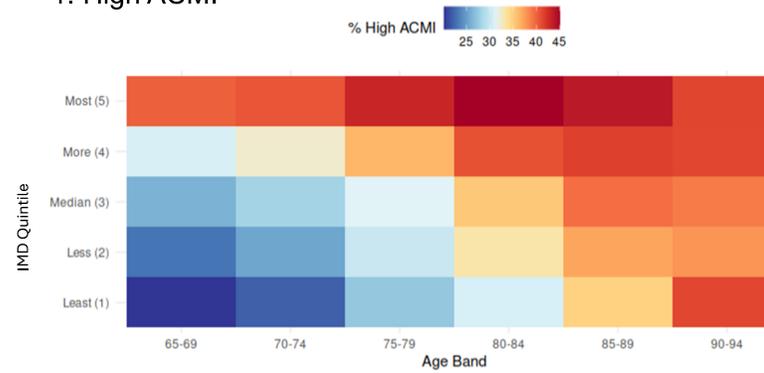
ACMI predicts increased risk of hospital admission with delirium or fall attributable to ACM burden

Comparing patterns of medicine reviews with ACMI, using whole population linked data

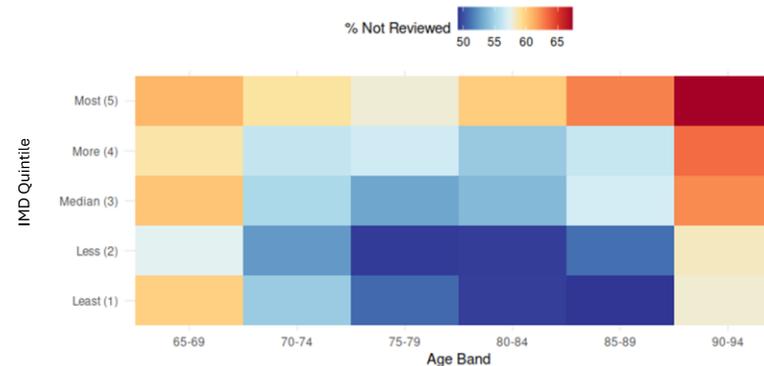
Inequality identified: Patients in deprived areas – with high ACMI, less likely to be reviewed than patients in less deprived areas with similar ACMI



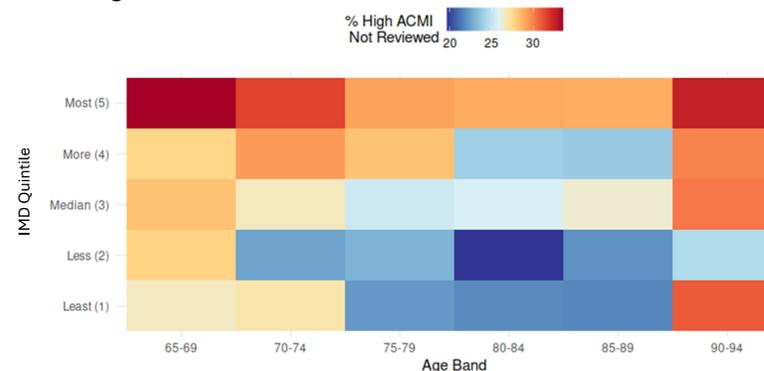
1. High ACMI



2. Not reviewed



3. High ACMI AND not reviewed



Calculate ACMI score on pseudonymised data



Select those who may benefit from a medication review most



Current status
Reidentify patients in the DSCRO and pass to medications management



Medications management assess patients to evaluate ACMI



Pilot targeted reviews using ACMI



UNIVERSITY OF LEEDS



NIHR Applied Research Collaboration North West Coast

Bringing patients, clinicians, data, artificial intelligence (AI) and public engagement experts together to address the major problem of medication burden

Identification of Barriers to Medicines Optimisation

Qualitative work with stakeholders and patients to identify barriers to facilitation of medicines reviews in three key multimorbidity groups with problematic polypharmacy :

1. Older people with frailty
2. People living with mental and physical health problems
3. People with four or more long-term health conditions taking ten or more medicines

Data Curation

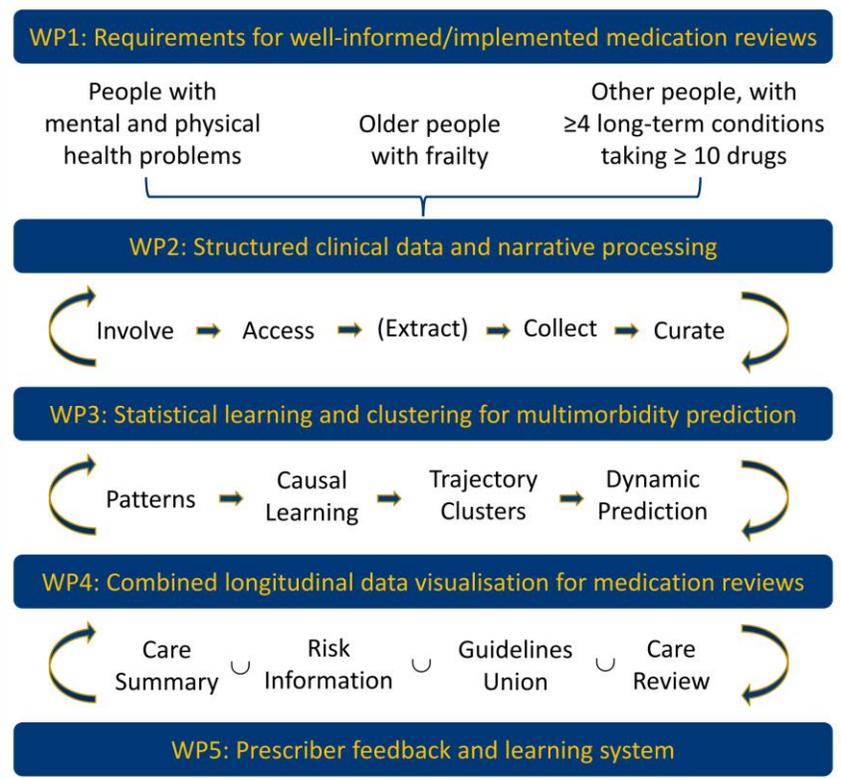
- Structured clinical data from integrated care records (general practice, hospital, and social care)
- Natural Language Processing (NLP) of unstructured clinical text

Development of New Tools for Medicines Optimisation

- AI systems trained to identify patterns of conditions, medications, tests, and clinical contacts preceding adverse events in order to identify individuals who might benefit most from an SMR
- New visualisations to support medicines optimisation
- Piloted in prescribing audit and feedback systems that clinicians are using in research and clinical practice
- PPIE integration at all stages

Better participation, data and contextual understanding

WP6: Public-patient-practitioner co-production/co-evaluation

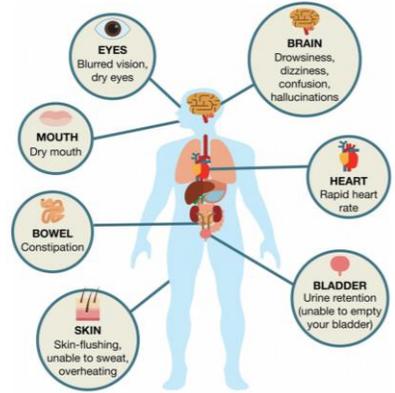


Continuous feedback of actionable information (learning system)

Medications treat and cause multiple conditions

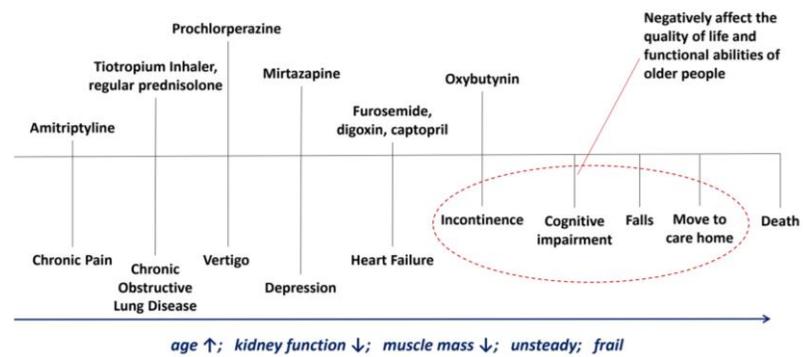
Example: Many common drugs prescribed for a wide range of reasons have **anticholinergic** side effects

- especially problematic for older people, but often overlooked by clinicians leading to harmful side effects such as delirium, falls and dementia

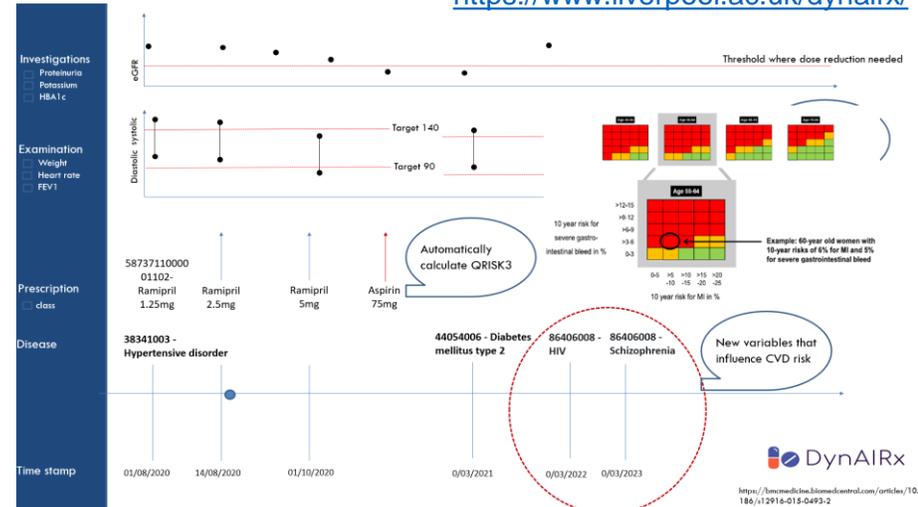


Hard problem: accumulation of medicines risks

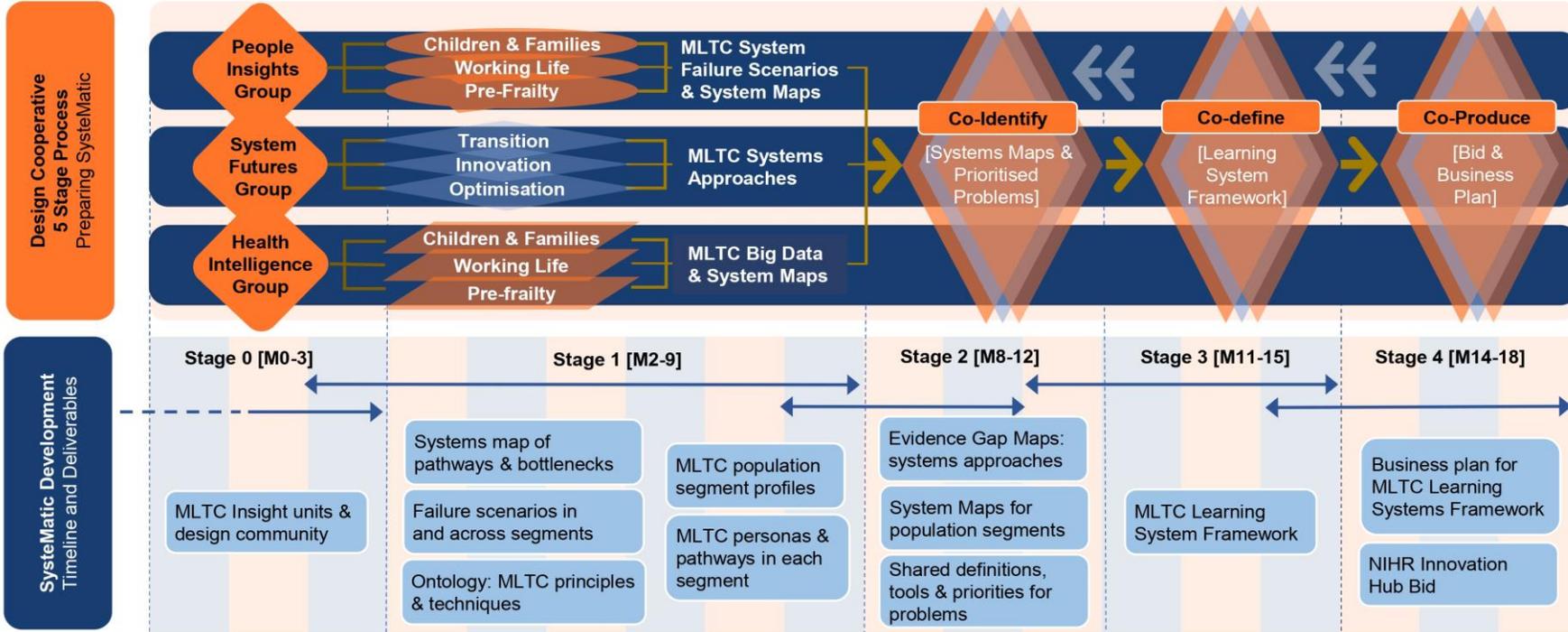
Escalating anticholinergic burden over long periods of time not easily seen in records



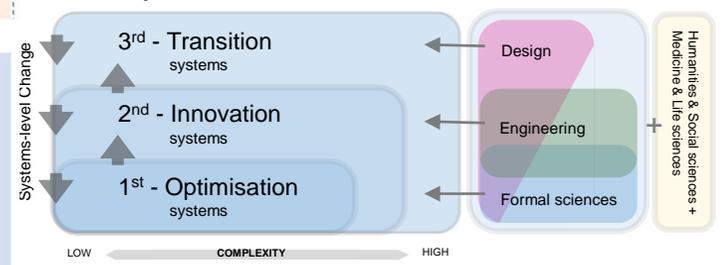
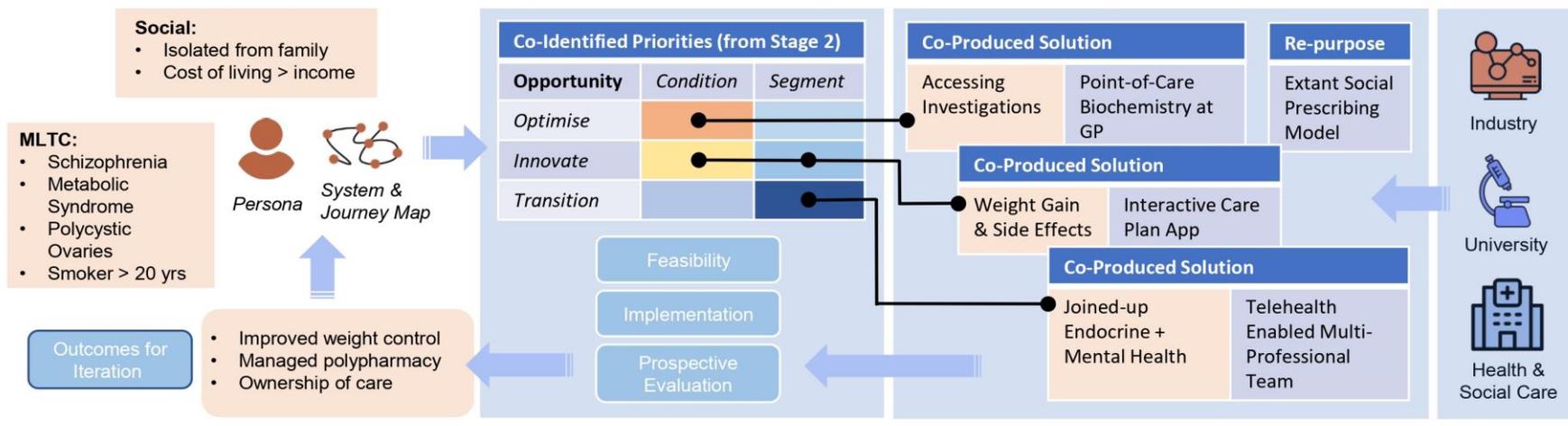
<https://www.liverpool.ac.uk/dynairx/>



SEISMIC Systematic: Prevention, Precision and Equity by Design for People Living with Multiple Long-Term Conditions



- NIHR + EPSRC Systems Engineering Innovation Hub for People with MLTC - Liverpool & Glasgow (socioeconomic disadvantage)
- 18-month development phase (2023-2024)
- Bringing together PPIE, stakeholders and data to co-identify, co-prioritise and co-design a programme of work focused on key challenges to systemic health & care across the lifecycle
- Clinical and health intelligence, design-led methodologies and social science approaches
- Developing the interdisciplinary design-led ICER framework for advanced PPIE
- 3 orders of systems science for health & social care systems



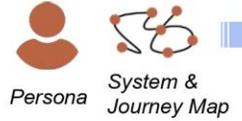
Engineering and Physical Sciences Research Council
 National Institute for Health Research

the INCLUSIONARIES lab for inclusive & human-centred design research

UNIVERSITY OF LIVERPOOL
 University of Glasgow

- MLTC:**
- Schizophrenia
 - Metabolic Syndrome
 - Polycystic Ovaries
 - Smoker > 20 yrs

- Social:**
- Isolated from family
 - Cost of living > income



- Feasibility
- Implementation
- Prospective Evaluation

- Outcomes for Iteration**
- Improved weight control
 - Managed polypharmacy
 - Ownership of care

Connected Mental Health

UK Mental Health Mission's

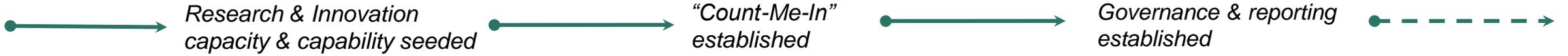
Mental Health Research for Innovation Centre: [M-RIC](#)



Linked Research Areas Embedded in NHS Capacity Building



TRAINING | CAPACITY DEVELOPMENT




WP1: CIX
(Data & Informatics)

- SDE engineering complete & operational
- Quantexa & Holmusk (Spring 2024)
- Linked to C&M ICB Data into Action programme



MEDICAL INFORMATICS | DATA & DIGITAL



WP4: C&YP
Digital MH

- Trial of Mindset digital therapeutic - platform development underway
- Adolescent Health Study Cohort EOI submitted



CYP; DATA & DIGITAL; C-GULL BIRTH COHORT



WP2: MH Avatar

- Industry liaison for platform development
- Trial of ESNTL WELLNESS platform in NHS staff



MEDICAL INFORMATICS | DATA & DIGITAL
TRD | MOOD DISORDER



WP5: Psychosis

- Protocol for *Neuroimmune Profiling for Trials of Novel Immune-based Therapies in Schizophrenia*
- Feasibility study underway
- Neuro bio-data bank links established



EARLY PSYCHOSIS



WP3: Innovative Tx for Mood Disorders

- Mood Clinic (Phase I Mood TRC plans-compliant)
- Data registry on CIX being developed (inc. ethics)



TRD | MOOD DISORDERS



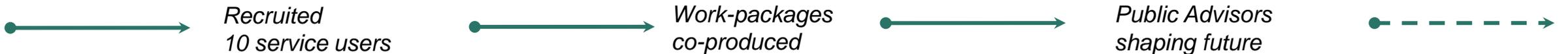
WP6: Public MH & Systems

- Social interventions evaluation commenced
- UKRI proposal Centre for Health Equity Studies Investment Accelerator submitted



(missing theme) ?POPULATION MENTAL HEALTH

ACROSS-WPs: EMBEDDED PPIE





Public and Patient Involvement and Engagement at M-RIC

PPIE Achievements to May 2024

- Establish an expert group of service-users and public advisors
- PPIE strategy established to complement existing Liverpool and TRC structures with the first phase of engagement
- Monitor local community representation and engagement by increased numbers of service-users trained and attending co-production activities and assess performance against our EDI commitments.
- Take a multi-experience, life-course approach to reflect place-based clusters of mental health risks and experiences across age groups.
- Invest in civic, system-wide communications (co-created with service-users) to highlight M-RIC's ambitions and activities.

Coproduction Activities

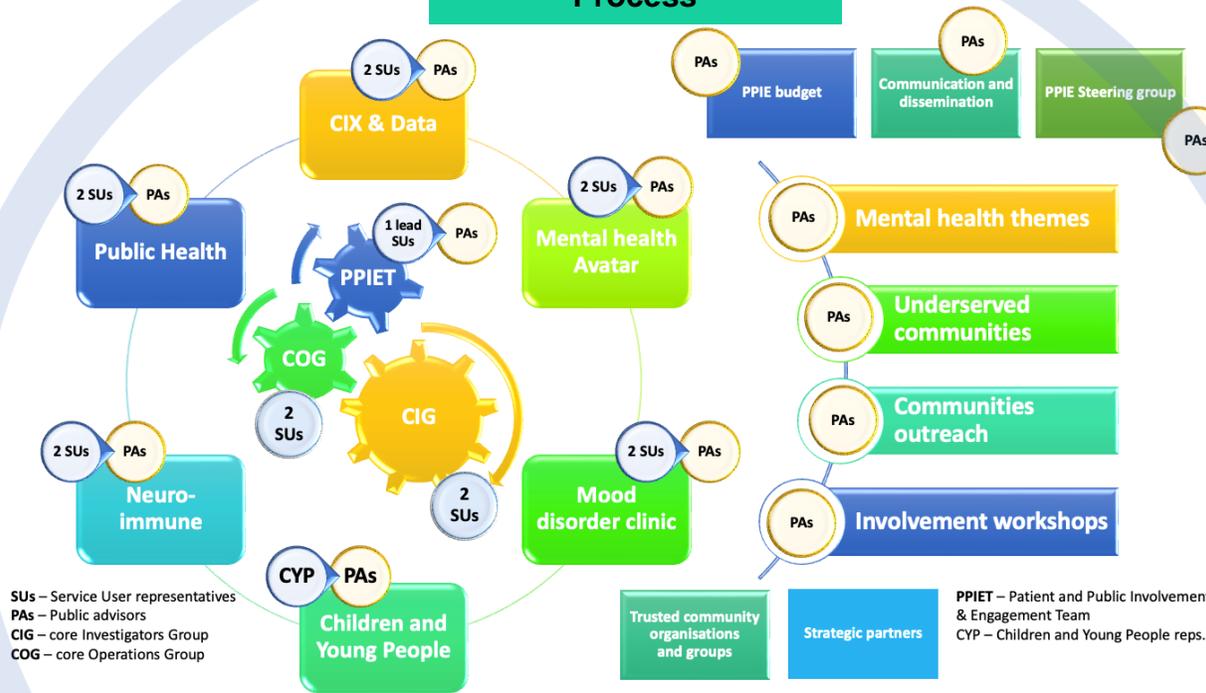
- Introductory workshop for Service Users & Carer Representatives (Jun 23)
- 7 Coproduction Workshops (Oct 23 – Apr 24)
- Welcome Event for public members (Mar 24)

Public Advisor Group

Participants: 31 members

Members of the public were recruited through Mersey Care and third sector networks to become M-RIC Public Advisors. They are from a range of backgrounds, with different experiences of mental health, and include service users, carers, health professionals and strategic partner representatives.

PPIE Structure and Process



Development and Outreach Activities

- Engagement with local third sector organisations with diverse populations such as Mary Seacole House African Caribbean Centre, the Black Women's Health Network
- Engagement with third sector organisations and groups active in the health and wellbeing sector: Walton, Bootle and Southport Life Rooms, Sefton CVS, Sefton in Mind, the Brink, Kensington Vision, Knowsley Health Watch Liaison with regional and national PPIE Community including ARC-NW, CoREN, NIHR Mission
- PPIE Activities for International Women's Day
- Developing annual calendar of Partner and Third sector events and Annual General Meetings to attend and brief members on M-RIC progress.

Table1 – Public Advisor perspectives

Total	Service users	Carers	Health professionals	Strategic partner reps.
31	24	3	2	2

Recruitment of 10 Service User Carer Reps

- Recruited 10 dedicated Service Users and carer Representatives to work alongside research leads
- Training in PPIE commenced for Service User Carer Reps and Public Advisors.
- Training includes, Introduction to Research, Strategic Reviews, Qualitative and Quantitative Methods, Health Economics and Coproduction.

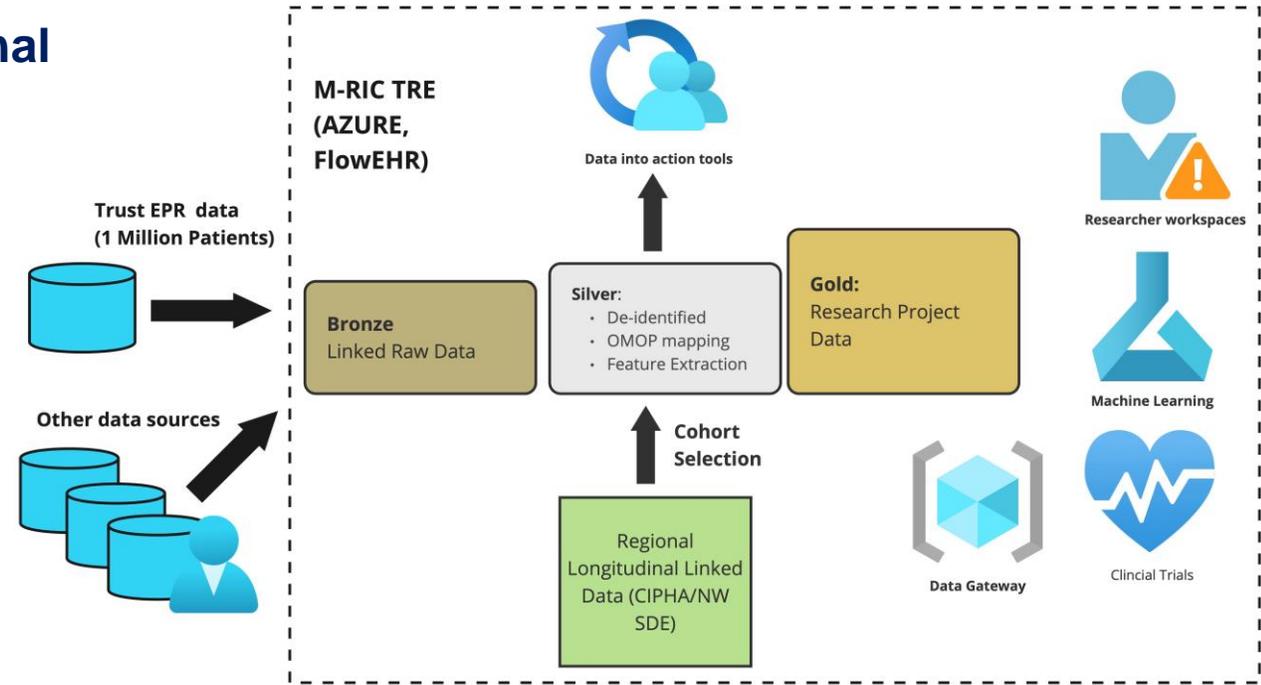


Public Advisors Group

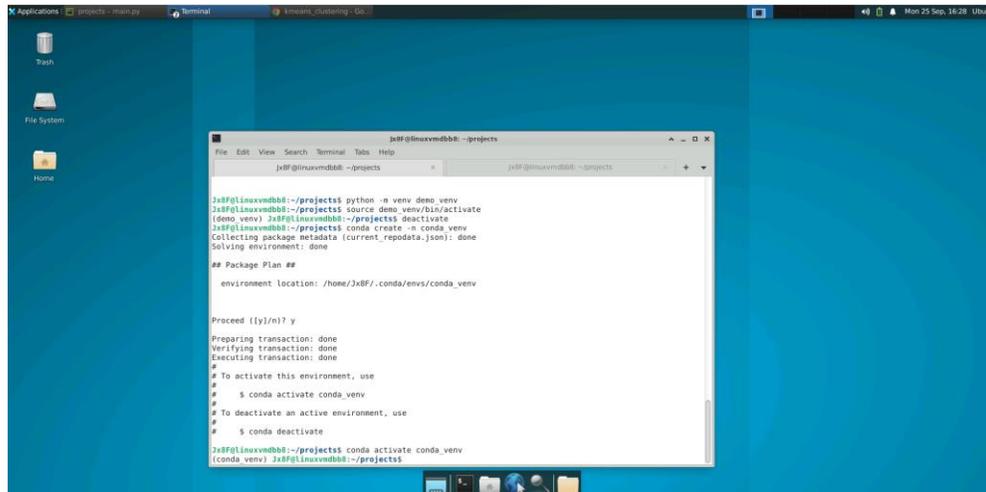


CIX: Combined Intelligence for Transitional Health Research: A Trusted Research Environment for M-RIC

- Open-source Trustworthy Research Environment co-developed with Microsoft and PA Consulting
- Provision of 1M patient structured and unstructured records
- Developed new, open-source tools for anonymization of the data, including clinical notes
- Improving automation for data request and provisioning
- Developing generative AI tools for interaction with the data
- Platform interaction with other, 3rd party research systems, including SDE, Holmusk and Quantexa



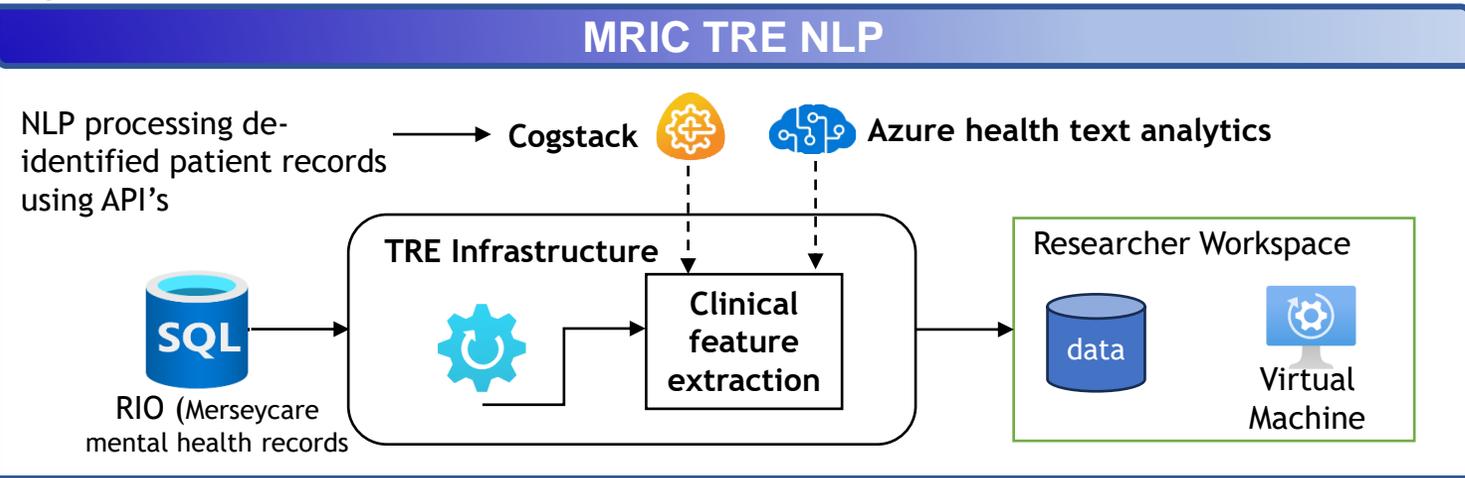
Partnerships & Engagement



TRE Virtual Machine



M-RIC Natural Language Processing



B EHR Summarization

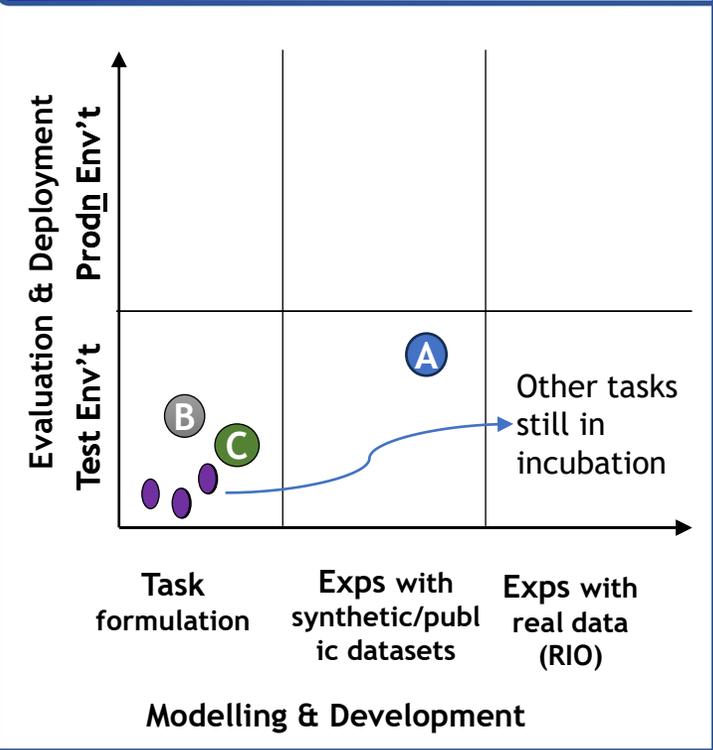
Background: Heavy alcohol use and deterioration in mood over last 7months. Suicidal thoughts. He has social stressors and has supervised access to children.....chlorodiazepoxide.

Language Model

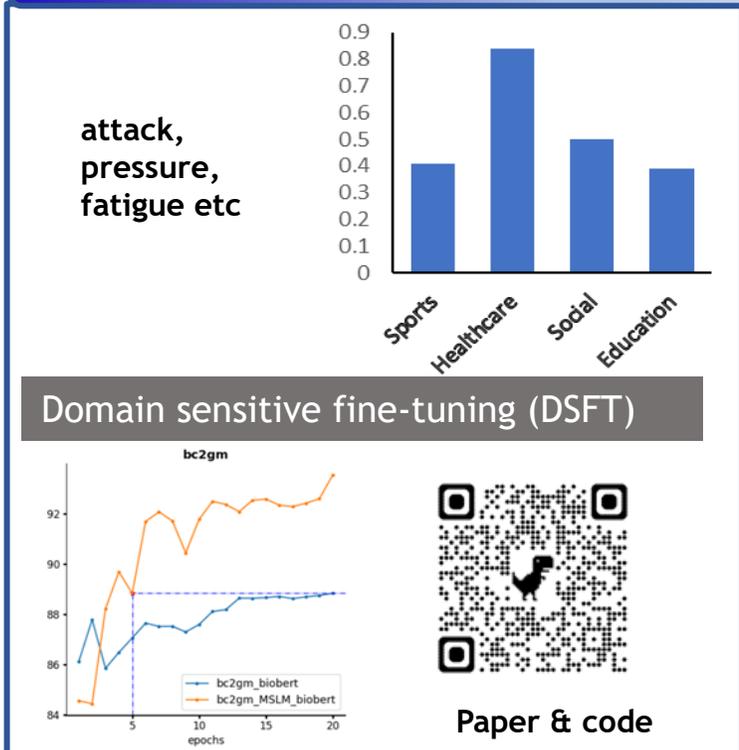
Patient profile

1. Chief complaint/reason for consultation	4. Treatment
- Social stressors	5. Diagnosis
- Mood deterioration	6. Symptoms
2. Medical history	- Chlorodiazepoxide
3. Findings	etc
- Supervised access to Children	

Medical Information Extraction Tasks



A AI's sensitivity to clinical terms



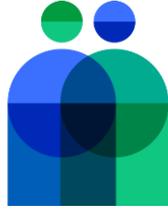
C Detect unknown links between drugs and outcomes

Patient data sources

1. Medical
2. Medicines management
3. Nursing Inpatient Note
4. Care review
5. Social worker etc

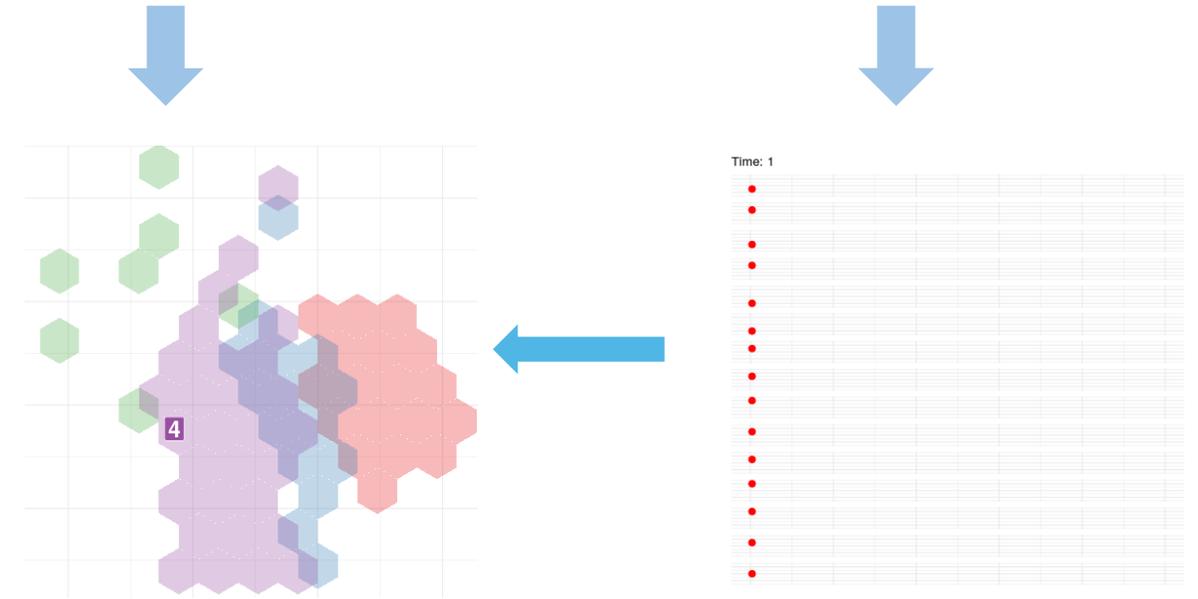
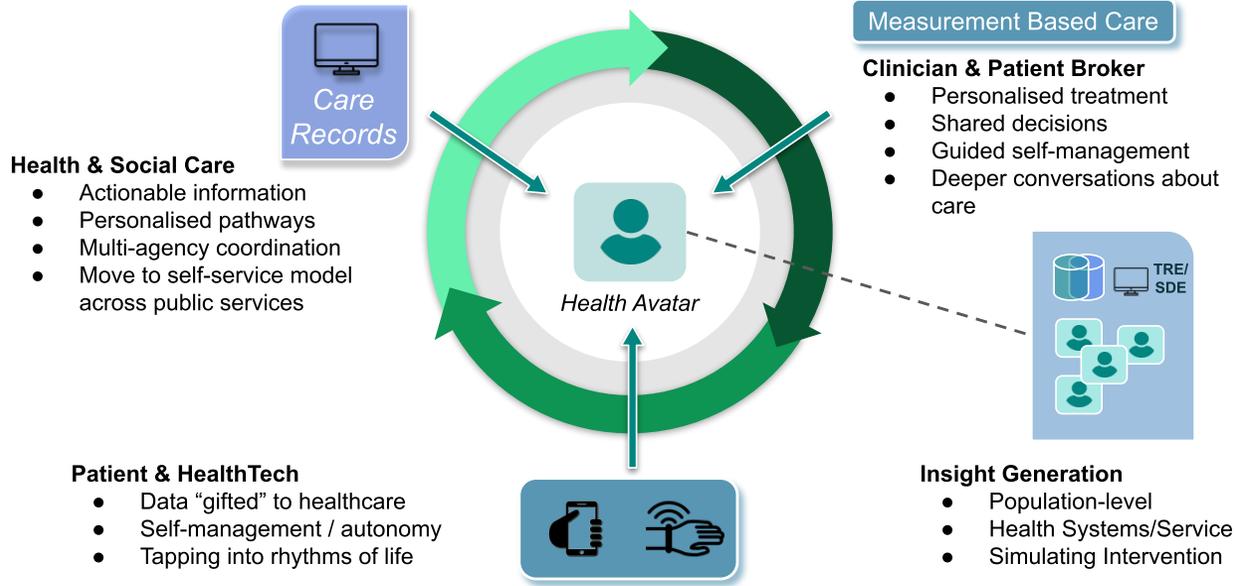
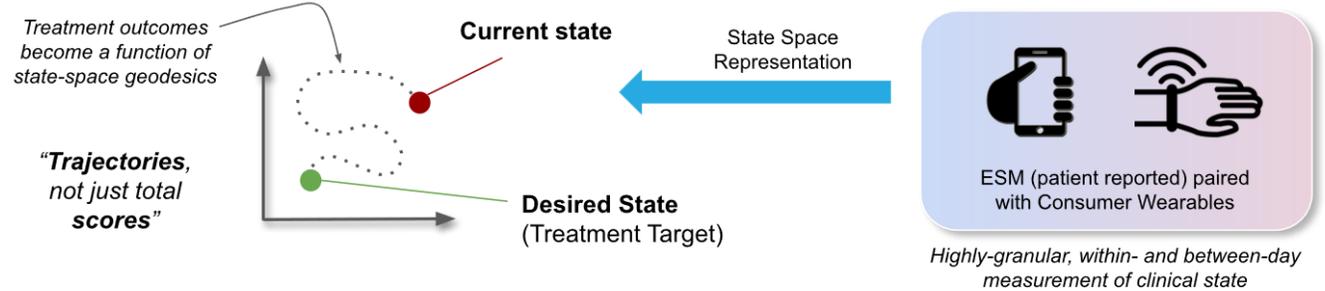
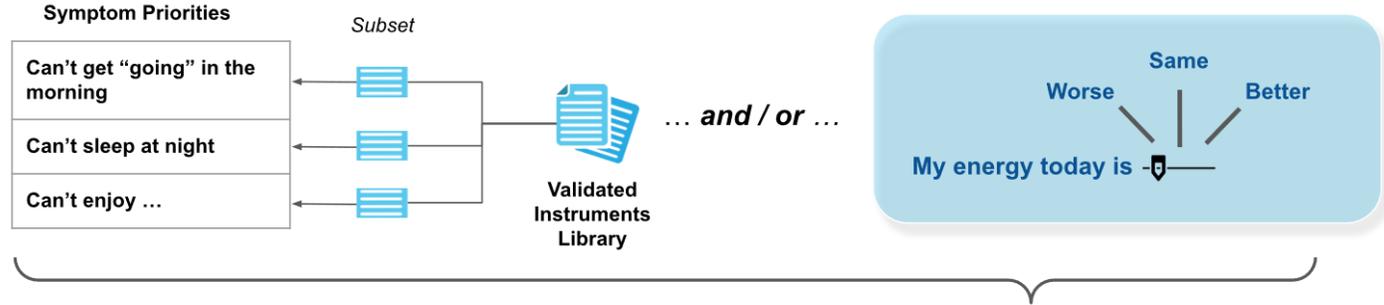
Adverse Drug Reactions

	Drugs			
	d_1	d_2	...	d_n
ADR_1			█	█
ADR_2	█		█	
...		█		█
ADR_m	█		█	█



Adaptive Measurement-Based Care

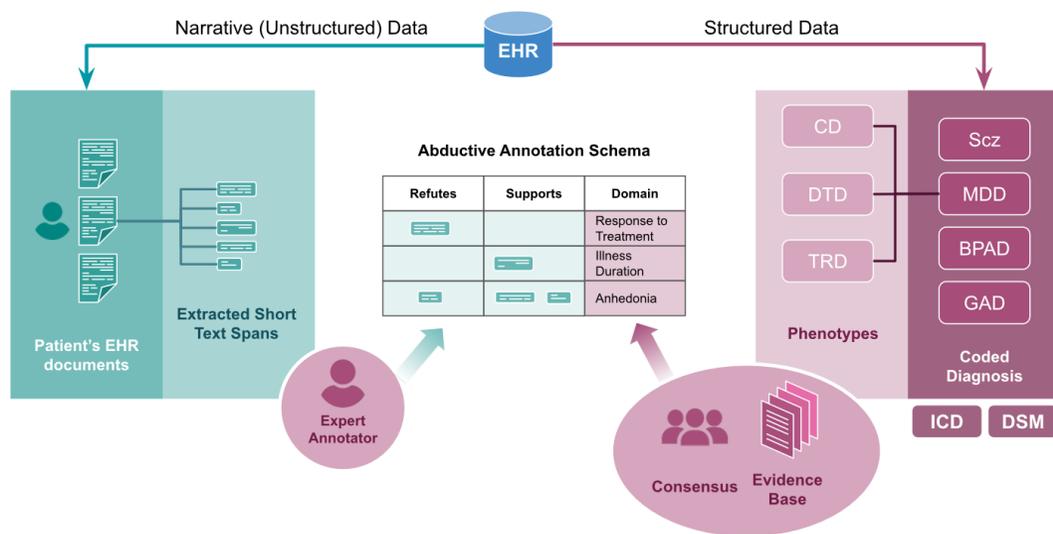
The User Interface for Health Avatars





Innovative Therapies for Mood Disorders

Aligning NLP-AI with Clinical Practice & Services

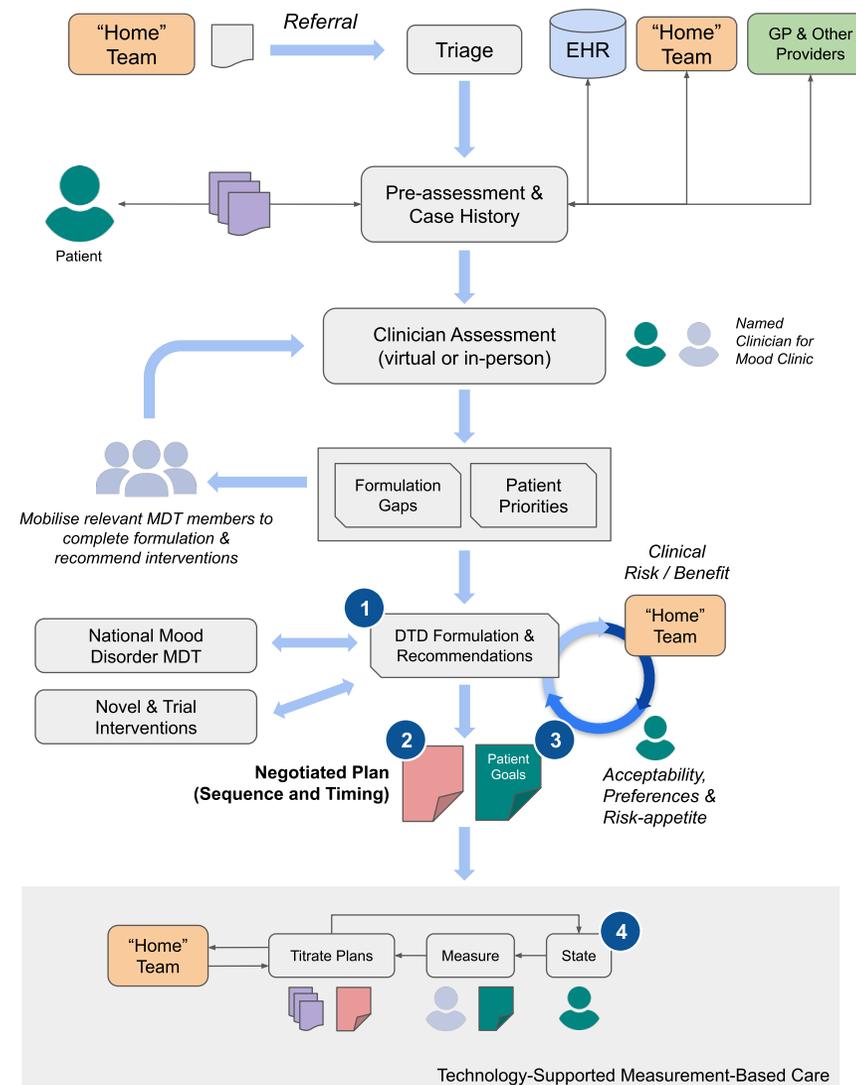


Leveraging Large Language Models for NLP-based Phenotype Capture ...

- Innovate on "end-to-end" categorical diagnostics from ingesting unstructured EHR data
- Define finer-grained, evidence-based **phenotypes** such as **difficult to treat depression (DTD)**
- Collect **routine clinical data** using an **abductive annotation schema**
- Use the **same schema** for expert curation & annotation of existing EHR data
- Train LLMs on the DTD phenotype to extract **signatures** to identify and stratify patients for trials

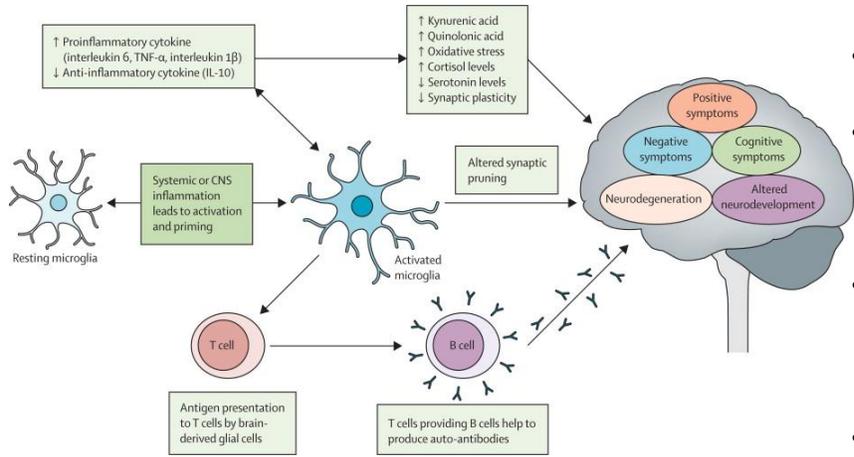
NHS MC² Mersey Care Mood Clinic

Mersey Care NHS Foundation Trust



Immune Profiling, Psychosis, Drug Repositioning

Figure 1



Blood markers of inflammation (cytokines) are increased in schizophrenia.

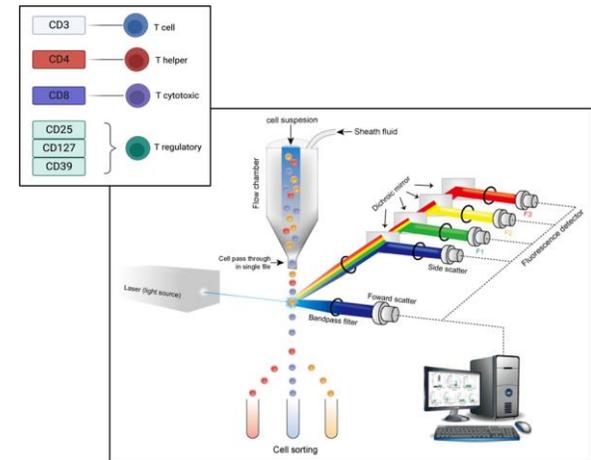
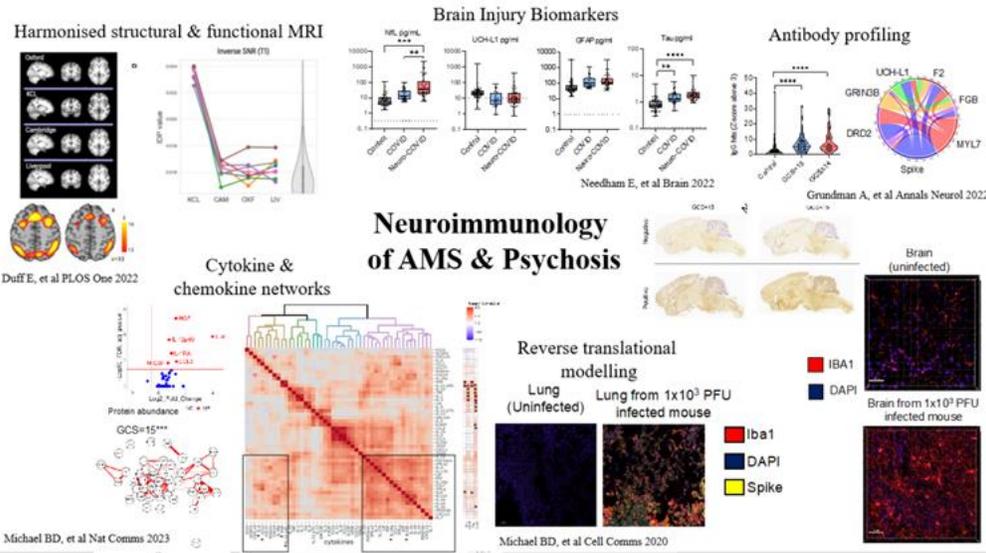
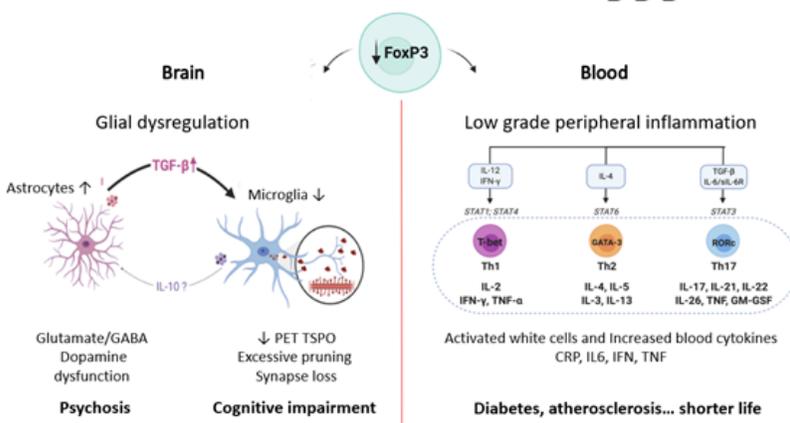
Two competing implications are:

- Figure 1: increased cytokines cause brain neuroinflammation which causes symptoms
- Figure 2: Increased cytokines indicate weakened control of peripheral immune responses by Treg cells which also fail in their function of regulating the development of neurons and their support cells called astroglia and microglia
- We have developed a prospective biomarker feasibility study (& qualitative sub-study) to measure Tregs, and blood markers of immunity, astroglia and neurons in patients with first episode psychosis, treatment-resistant schizophrenia and healthy controls.
- Proposed clinical trial to determine: *Can low-dose methotrexate restore the apparent TReg control of glia and so normalise the neurotransmitter changes associated with psychosis?*



Figure 2 **A novel immune mechanism of psychosis**

Impaired regulatory T lymphocytes (Tregs)





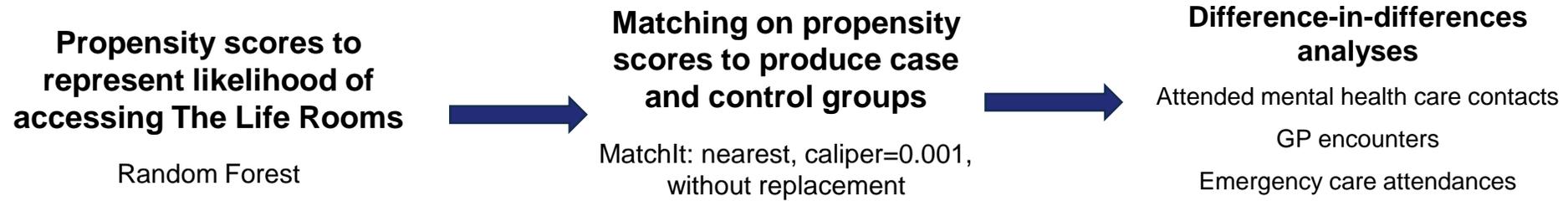
Public Mental Health Innovations



- Co-producing a Meaningful Involvement Assessment Toolkit with PPIE colleagues
- Examine the psychological impacts of meaningful involvement in mental health research (hope and mattering)
- NIHR Pump-priming application to build research capacity in our PPIE group

- Liverpool City Region Adverse Childhood Experiences Alliance. With LJMU Profs. Bellis and Quigg
- To bring together LCR work on ACES, their prevention and trauma informed practices
- To make LCR an ACE aware, trauma informed region and to lead a prevention-focussed, collaborative public mental health research agenda





Propensity scores generated using various features including IMD score, age, sex, ethnic origin, social care utilisation, mental health care utilisation, physical and mental health diagnoses, mental health prescriptions, GP utilisation, emergency care utilisation, and mental health ward stays.

People who first accessed The Life Rooms in 2021 matched to eligible controls (people with no record of Life Rooms access) matched on propensity score.

Samples of 1,419 case and control subjects used in most instances, with subsamples taken for specific use cases.

Difference-in-differences analyses conducted across a range of healthcare settings to quantify the impact of accessing The Life Rooms, and the impact of only being prescribed Life Rooms Learning interventions.

First accessing The Life Rooms in 2021 resulted in:

- ☆ **184 fewer contacts with the Early Intervention for Psychosis (EIP)** service in the first year following access,
- ☆ **246 fewer contacts with the EIP** service in the second year following access,
- ☆ **71 fewer contacts with the Psychiatric Liaison service** in the first year following Life Rooms access,
- ☆ **171 fewer CMHT contacts** in the second year following Life Rooms access,
- ☆ **417 fewer GP encounters** in the second year following Life Rooms access,

than if individuals had not used The Life Rooms.

First accessing The Life Rooms in 2021 and only being prescribed Life Rooms Learning interventions resulted in greater impacts for:

- ☆ **EIP service** in the first- and second-years following Life Rooms access,
- ☆ **Crisis resolution treatment team/home treatment service** in the first year following Life Rooms access,
- ☆ **Psychiatric Liaison service** in the first- and second-years following Life Rooms access,
- ☆ **General Psychiatry** in the second year following Life Rooms access,
- ☆ **Emergency care attendances** in the first year following Life Rooms access,

than for service users prescribed a combination of interventions funded and not funded by The Life Rooms.

Civic Health Protection

Health Protection Data Science and Civic Action for
Pandemic Preparedness and Antimicrobial Progress

SUPPORTED BY

NIHR

National Institute for
Health and Care Research

NHS

Liverpool University Hospitals
NHS Foundation Trust



UK Health
Security
Agency



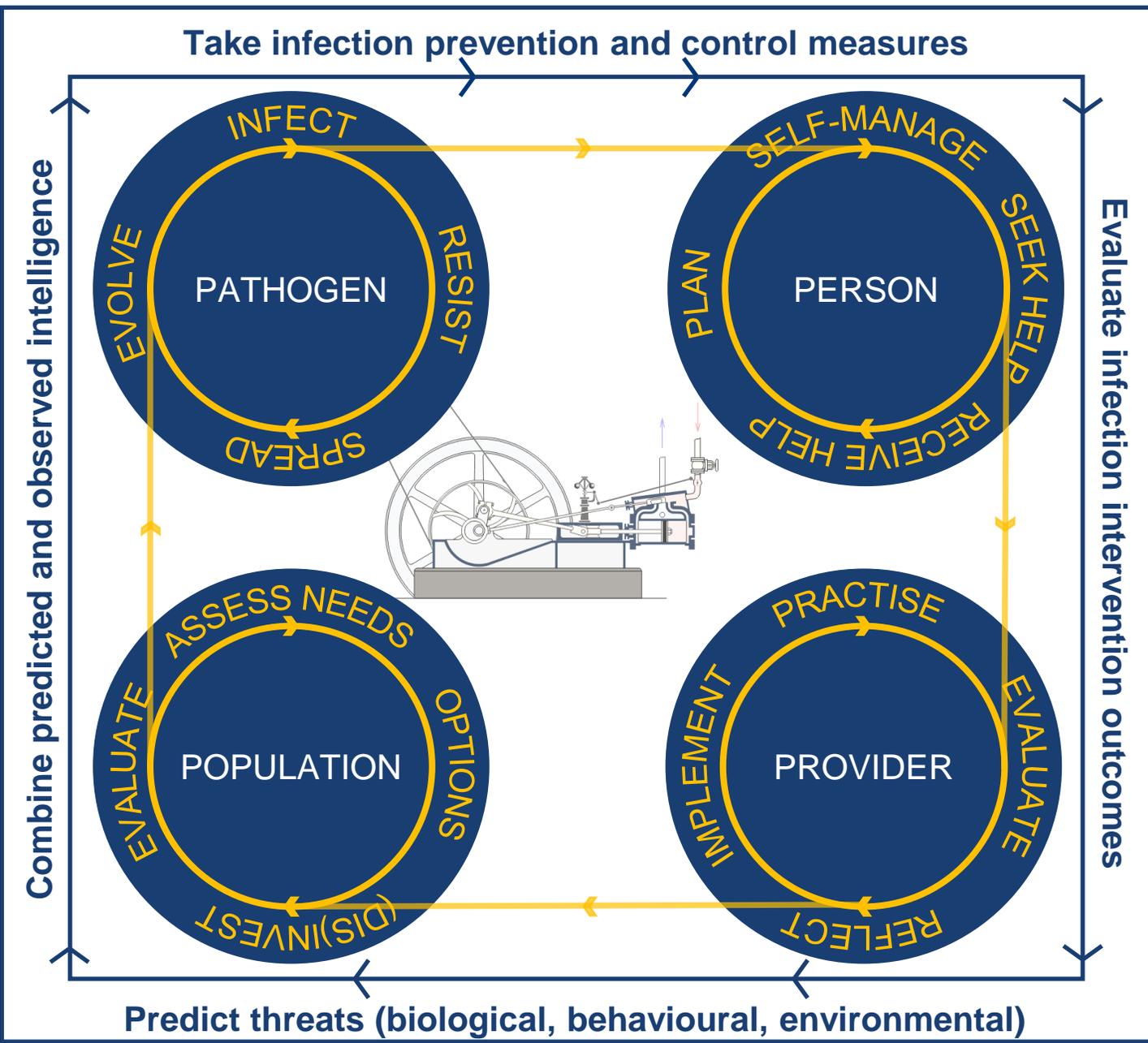
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CITY REGION**
COMBINED AUTHORITY

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LIVERPOOL CITY REGION



Tackling global health challenges with civic data and innovation

AMR-X: LIVERPOOL ANTIMICROBIAL LEARNING SYSTEM: AI for Sustainable Healthcare



- **DATA LINKAGE**
 - Regional secure data environment
- **DATA SCIENCE**
 - Healthcare simulation
 - AMR prediction models
 - Antimicrobial & diagnostic utility functions
- **INCLUSIVE DESIGN & IMPLEMENTATION**
 - Translational expertise & co-design
 - Dynamic Formularies & policymaking
 - Personalised diagnostics



Input booked specimens
 Browse... urines_to_test.csv
 Upload complete

Select specimen number
 9028744

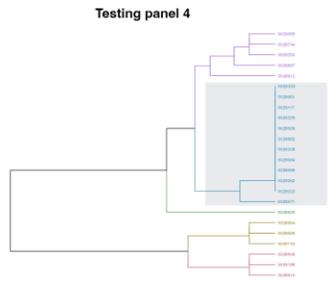
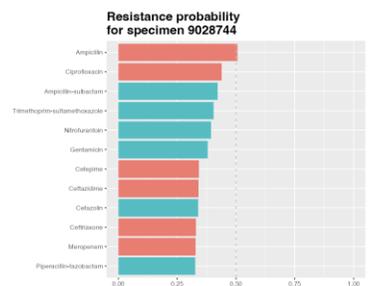
Efficiency-optimised ordering

Select testing panel size
 1 6 11

Select number of panels
 1 6

Recommend tests | Recommend panels

Recommended tests	AWaRe Utility
Ampicillin-sulbactam	1.60
Cefazolin	1.70
Gentamicin	1.60
Nitrofurantoin	1.60
Piperacillin-tazobactam	0.70
Trimethoprim-sulfamethoxazole	1.60



Recommended session panels:

1	2	3	4	5
Cefazolin	Ampicillin	Ampicillin	Ampicillin	Ampicillin
Cefepime	Ampicillin-sulbactam	Ampicillin-sulbactam	Ampicillin-sulbactam	Ampicillin-sulbactam
Ceftriaxone	Cefazolin	Cefepime	Cefazolin	Cefepime
Gentamicin	Gentamicin	Ceftazidime	Gentamicin	Ciprofloxacin
Meropenem	Nitrofurantoin	Ciprofloxacin	Nitrofurantoin	Nitrofurantoin
Trimethoprim-sulfamethoxazole	Trimethoprim-sulfamethoxazole	Piperacillin-tazobactam	Piperacillin-tazobactam	Piperacillin-tazobactam



Liverpool University Hospitals
 NHS Foundation Trust



Cheshire and Merseyside



Twitter: @HPRUgi / Website: www.hprugi@nihr.ac.uk / E-mail: hprugi@liverpool.ac.uk

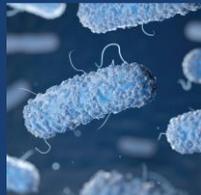


People and Places

Exploring socio-economic, environment and behavioural factors in gastrointestinal infections

Data and Informatics

Developing methods for surveillance and outbreak control



Pathogens and Microbiomes

Combating gastrointestinal infections with genome sequencing

Predict and Prevent

Epidemiological prediction to guide disease prevention



About Us:

One in four of the population in the UK suffers from gastroenteritis each year. The NIHR Health Protection Research Unit in Gastrointestinal Infections brings together leading researchers from the University of Liverpool, UK Health Security Agency and the University of Warwick. Through collaboration and knowledge sharing, this integrated, multidisciplinary research programme will generate new strategies to protect the UK population from diarrhoeal diseases, and will play a pivotal role in maintaining and growing the UK Health Security Agency's scientific expertise and future workforce.

Our Aims:

1. Improve methods for the surveillance and control of gastrointestinal infections, including among underserved communities in whom the disease burden is greatest.
2. Enhance detection and tracking of microbes that cause gastroenteritis to prevent disease outbreaks.
3. Through high quality, multidisciplinary training, equip health protection scientists with the necessary knowledge and skills to help reduce the population burden of gastrointestinal infections.
4. Engage strongly with patients and the public in our research and with wider stakeholders to support knowledge mobilisation.

Examples of our Impact:

- Application of whole genome sequencing to identify outbreaks of Salmonella gastroenteritis
- Genetic profiling has transformed the epidemiological surveillance of Cryptosporidium infection
- Revolutionising gastrointestinal infection diagnostics at clinical and public health frontlines using molecular methods

"Gastrointestinal infections continue to place a major burden on the UK population. By developing new methods for disease surveillance and pathogen detection across all groups in society, we will develop new approaches to control diarrhoeal diseases and contribute to reducing health inequalities".

Nigel Cunliffe, Director, and Roberto Vivancos, UK Health Security Agency Lead, NIHR Health Protection Research Unit in Gastrointestinal Infections.



Patient and Public Involvement and Engagement

We will embed active forms of patient and public involvement and community engagement across the HPRU to ensure patients and the public are involved in co-producing public health knowledge of importance and relevance to them.



Knowledge Mobilisation

Using targeted and diverse dissemination strategies to share our findings, our research will catalyse change to reduce morbidity associated with gastrointestinal infections.

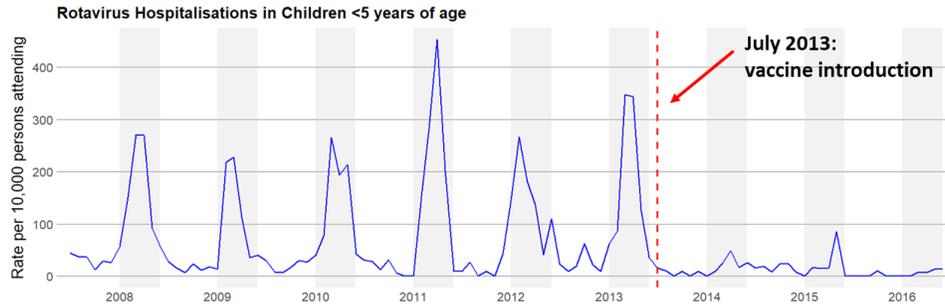


Research Capacity Development

Through education and training we will develop staff capacity and capability in gastrointestinal infections, thus growing the human resource that will help develop and apply enhanced infection prevention and control strategies to protect the health of the population now and in the future.

Vaccine Evaluations and Inequalities: Real-world Data Informing Vaccine Policy

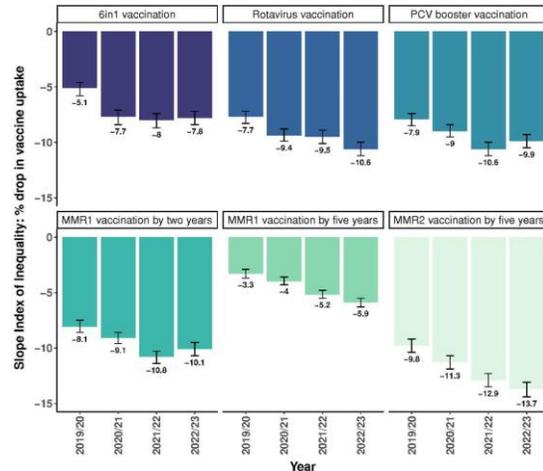
Rotavirus vaccine evaluation Liverpool City Region



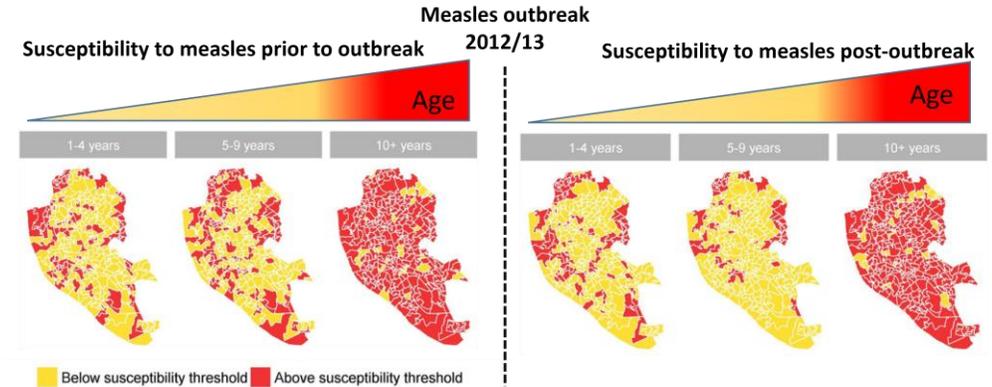
- Direct and indirect benefits across a healthcare system
- Greatest benefit in most deprived populations despite lower uptake
- Novel methods for evaluations - long term rotavirus vaccine impact

COVID-19 Pandemic: C&M Responsive work

- Modelling covid-19 vaccine effectiveness
- Understanding inequalities in SARS-CoV-2 infection/vaccination
- Paediatric vaccinations – since covid-19 equity gap widening with



MMR and measles: collaborative public health research



Investigating the off-target effects of vaccines: driven by PPIE



- Impact of rotavirus vaccination on T1 diabetes & coeliac disease
- Shingles, pneumococcal re-vaccination and influenza in adults

Impact and Legacy

- Informed JCVI recommendations COVID-19 vaccine rollout
- University impact case study on rotavirus vaccines
- Informed rotavirus vaccine introduction in France
- Targeted measles catch-up campaigns
- Funding with industry, UKRI, Wellcome Trust & NIHR
- Winners: Delivering Research in Collaboration (NWC Research and Innovation Awards and PHE Science and Research Awards)

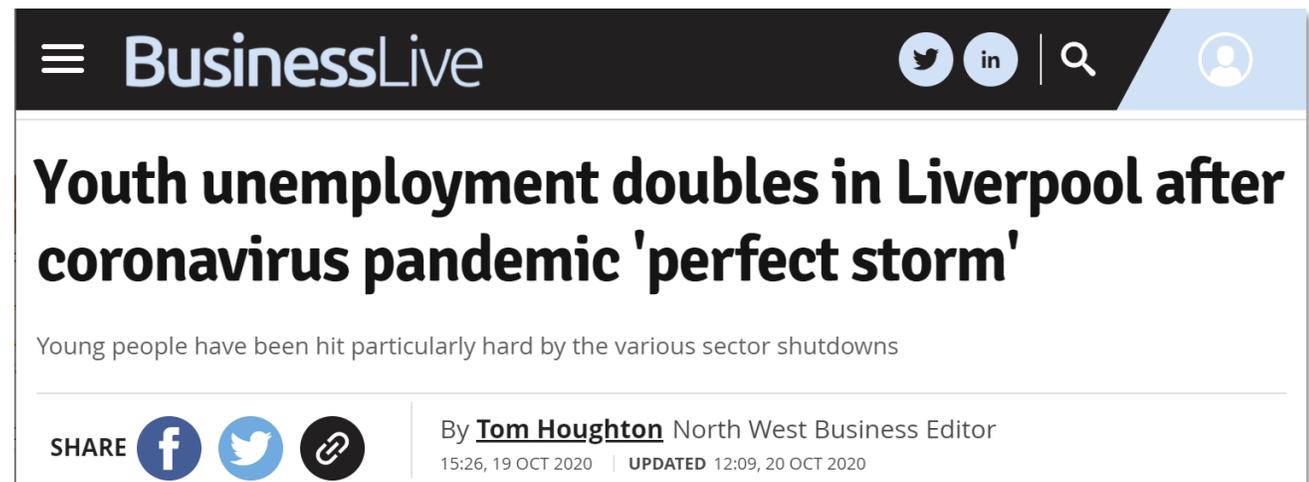


Liverpool Mid-October 2020

- COVID-19 **deaths** surge
- One of most **deprived** parts of UK
Third of children born in poverty
- **Job-losses** surge from
COVID-19 restrictions
- Visitors, hospitality and events
form **half** of Liverpool's **economy**
- **Lockdowns** a public health hazard
as well as SARS-CoV-2



The screenshot shows the ECHO Liverpool website. The header is red with the ECHO logo and a swan icon. Navigation links include NEWS, IN YOUR AREA, LIVERPOOL FC, EVERTON FC, WHAT'S ON, CELEBS, SPORT, and SPECIAL FEATURES. The main article headline is "Liverpool NHS Trust has highest number of coronavirus patients in the whole of England". The sub-headline reads: "Admissions of people with coronavirus are approaching the peak levels of last spring, city hospitals boss has warned". The article is by Luke Traynor (Chief Reporter) and Liam Thorp, dated 10:41, 10 OCT 2020. Social sharing icons for Facebook, Twitter, and LinkedIn are visible, along with a comment count of 9.



The screenshot shows the BusinessLive website. The header is dark with the BusinessLive logo and social media icons for Twitter and LinkedIn. The main article headline is "Youth unemployment doubles in Liverpool after coronavirus pandemic 'perfect storm'". The sub-headline reads: "Young people have been hit particularly hard by the various sector shutdowns". The article is by Tom Houghton (North West Business Editor), dated 15:26, 19 OCT 2020, and was updated at 12:09, 20 OCT 2020. Social sharing icons for Facebook, Twitter, and LinkedIn are visible.

Liverpool End-October 2020

- UK **Government offers** Liverpool **military assistance** to screen around 75% of the population weekly for SARS-CoV-2 antigen with a new test
- Liverpool considers **unpublished (from Porton Down) biological evidence** on lateral flow test performance and the proposed testing approach by Liverpool
- **Liverpool accepts** the Government offer on **three conditions**:
 - University of Liverpool leads an **independent evaluation** of test device and end-to-end testing performance
 - Unrealistic goal of testing 75% of a City weekly changed to Liverpool-defined **SMART** ([Systematic, Meaningful, Asymptomatic, Repeated Testing](#)) **protocol**
 - Liverpool receives a **real-time** feed of test result **data** from NHS Test & Trace

Liverpool November 2020: Rapid Testing Pilot

- World's **first city-wide pilot** of testing for people without COVID symptoms to save lives and livelihoods
- **Quarter** of population **volunteered** in a month despite external media negativity
- **Case detection increased** by a **fifth**
- **Known case rate fell** by a **fifth**
- **Hospitalisation fell** by a **quarter**

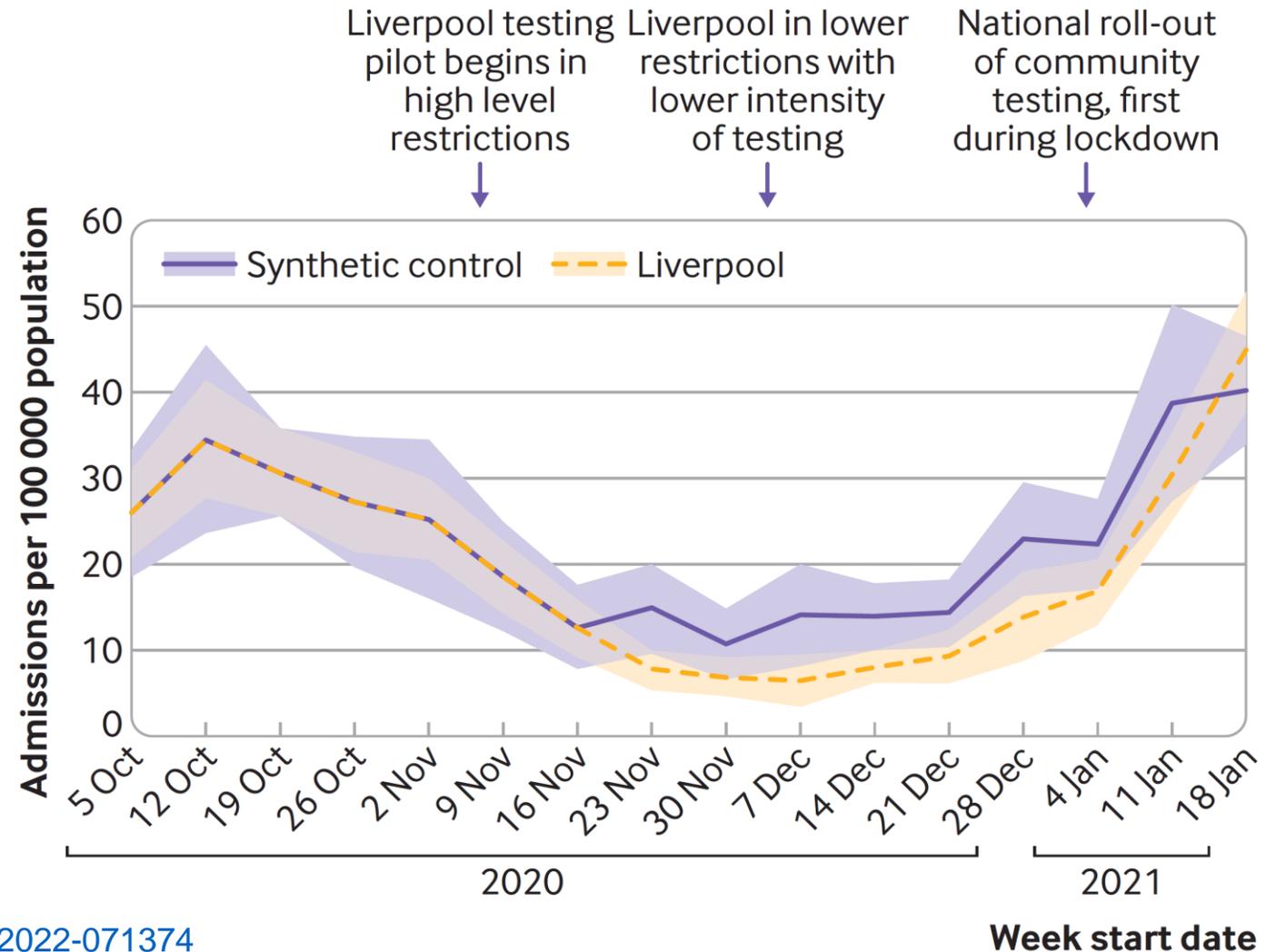
www.bmj.com/content/379/bmj-2022-071374

www.liverpool.ac.uk/coronavirus/research-and-analysis/covid-smart-pilot/



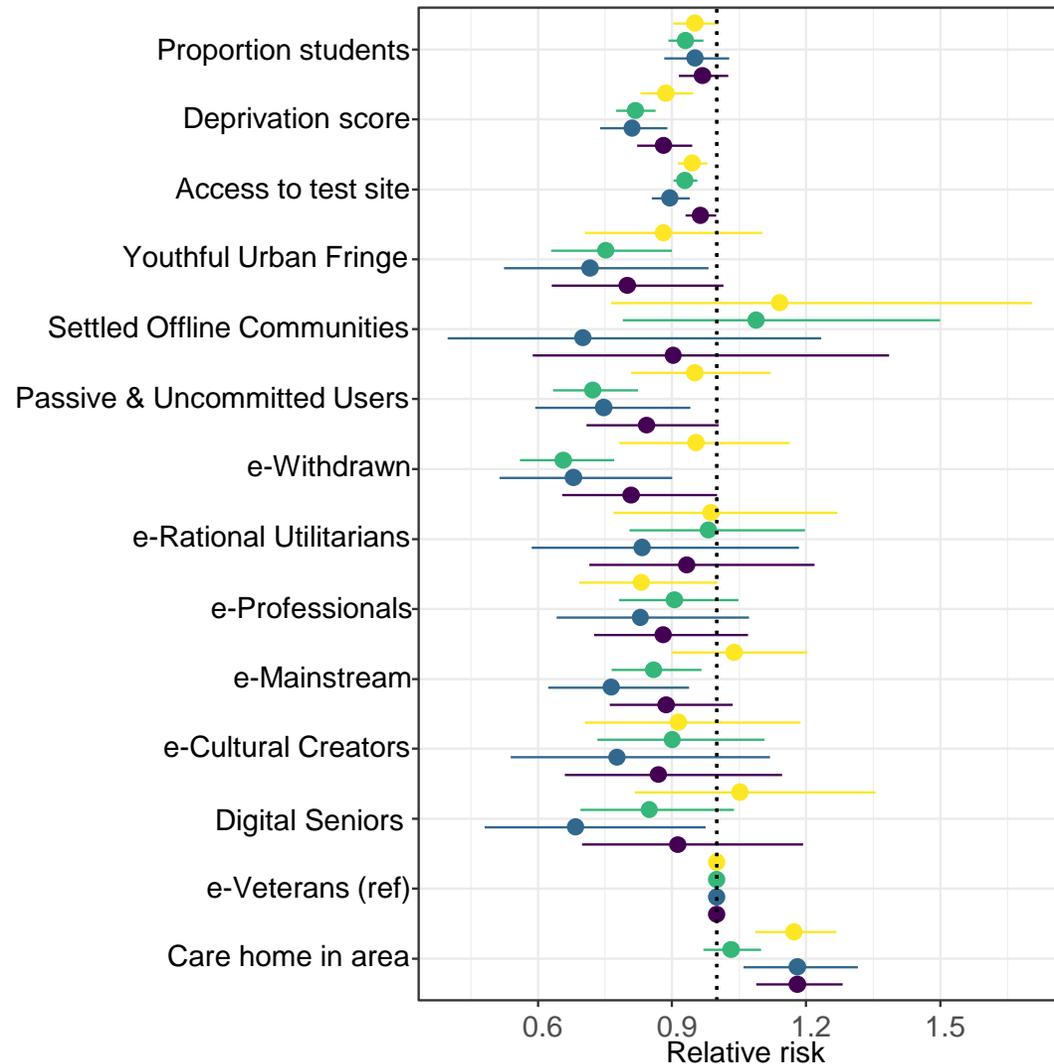
Impact of 'Mass Testing' Pilot on Covid-19 Hospitalisations

- **Synthetic control** analysis making neighbourhoods similar in terms of background risks, epidemic and control measures
- Initial mass testing with military: **43%** (29% to 57%) **reduction** in COVID-19 hospital admissions
- Overall community testing pilot with handover to local services **25%** (11% to 35%) **reduction**



- Results: <https://www.bmj.com/content/379/bmj-2022-071374>
- Methodology: <https://www.bmj.com/content/379/bmj.o2712>
- Policy impacts: www.liverpool.ac.uk/coronavirus/research-and-analysis/covid-smart-pilot/

Digital Poverty → Low Test Uptake: Need Universal Access



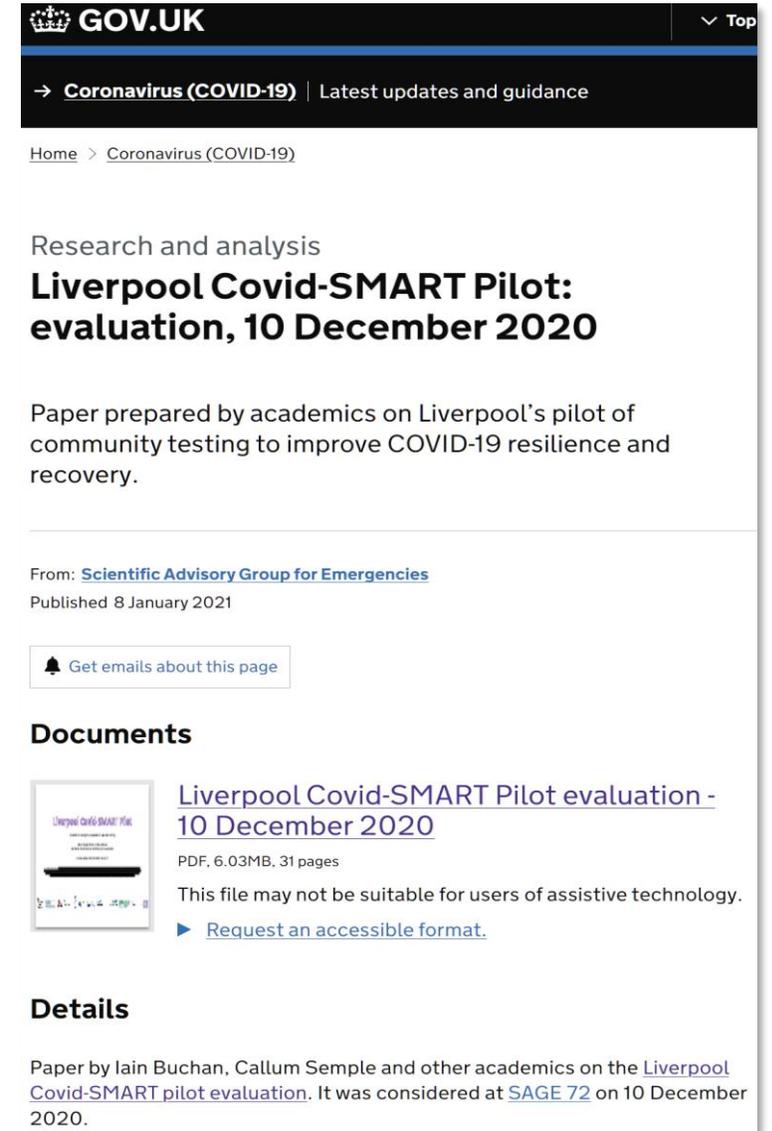
- Liverpool pilot demonstrated **lower uptake** of testing and higher infection rates among the most **deprived** and the **digitally excluded** (Internet User Classification of neighbourhoods)

- Community testing roll-out advised to focus more on interactions of **biology, behaviour** and **environment** (end-to-end testing)
- Need to reduce **digital complexity**
- Isolation payments needed for those who **can't afford to isolate**

London December 2020: Community Testing Policy Made

- End-to-end testing **evaluation** considered by UK Scientific Advisory Group for Emergencies and Universal Access Community Testing **policy** made
- Media **debate** over 40% lateral flow sensitivity vs PCR, confusing clinical test of having been infected with public health test of being ~infectious
- Public health utility function to optimise:
1/time to % appropriate action (e.g., isolation)
30 min lateral flow vs 48h PCR
consider **'actionable accuracy'**

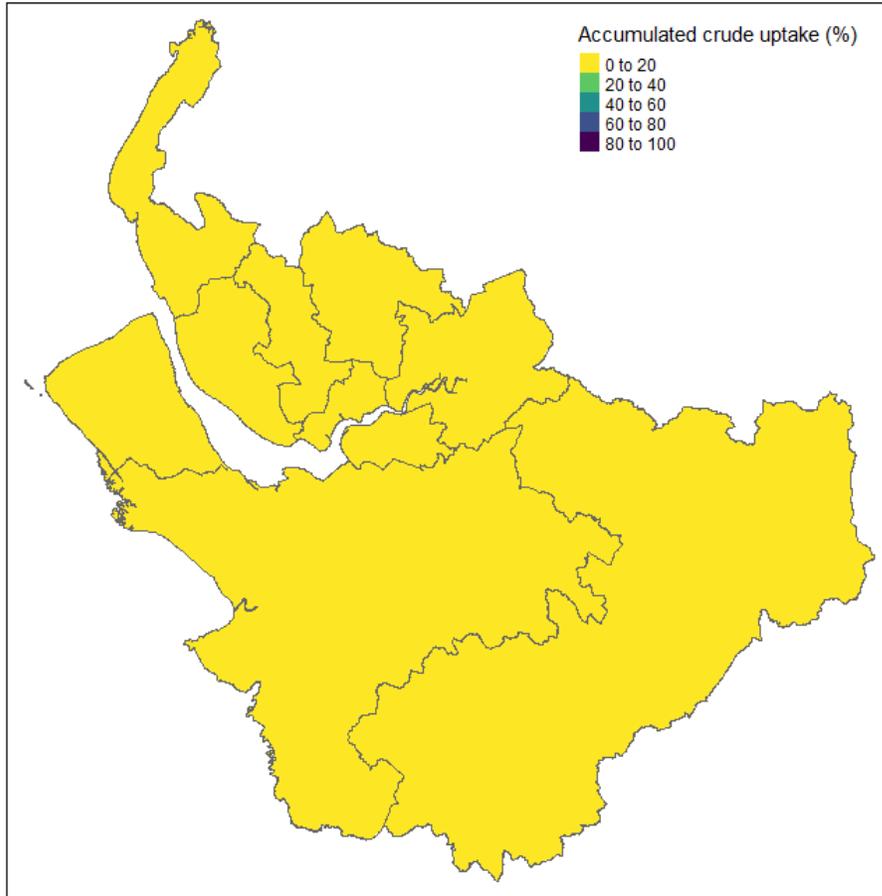
[Clarifying the evidence on SARS-CoV-2 antigen rapid tests in public health responses to COVID-19. Lancet. 2021 Apr 17;397\(10283\):1425-1427](#)



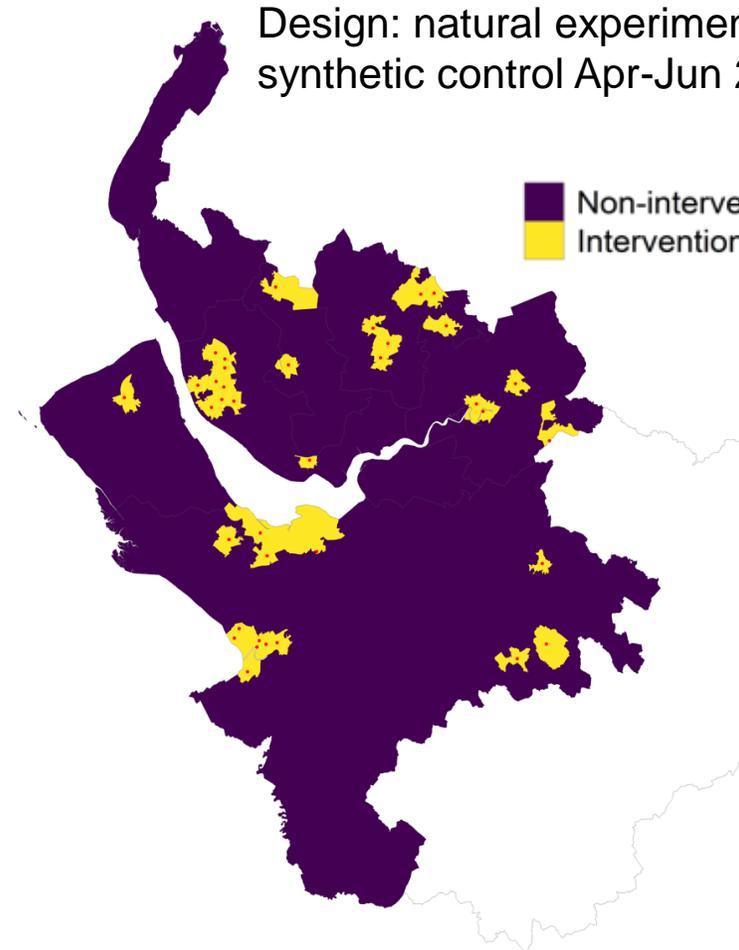
The screenshot shows a GOV.UK webpage. At the top, there is a navigation bar with the GOV.UK logo and a 'Top' link. Below this is a breadcrumb trail: 'Home > Coronavirus (COVID-19) | Latest updates and guidance'. The main content area is titled 'Research and analysis' and features the headline 'Liverpool Covid-SMART Pilot: evaluation, 10 December 2020'. A sub-headline reads: 'Paper prepared by academics on Liverpool's pilot of community testing to improve COVID-19 resilience and recovery.' Below this, it states 'From: Scientific Advisory Group for Emergencies' and 'Published 8 January 2021'. There is a button to 'Get emails about this page'. A 'Documents' section shows a PDF icon and the title 'Liverpool Covid-SMART Pilot evaluation - 10 December 2020', with details 'PDF, 6.03MB, 31 pages' and a note 'This file may not be suitable for users of assistive technology.' with a link to 'Request an accessible format.'. A 'Details' section at the bottom states: 'Paper by Iain Buchan, Callum Semple and other academics on the Liverpool Covid-SMART pilot evaluation. It was considered at SAGE 72 on 10 December 2020.'

Using Mobile Vaccination Units to Increase COVID-19 Vaccination Uptake

2020 W50 Motivation: uptake inequalities



Design: natural experiment;
synthetic control Apr-Jun 2021



Outcome: a **25%** (95% CI 21% to 28%) increase in uptake within 3 weeks after first deployment

<https://bmjopen.bmj.com/content/13/10/e071852.long>



Covid-risk-mitigated, Data-driven Reopening of Mass Events

- **12,256 people** from Liverpool City Region attended business, nightclub and music events in Liverpool 28 Apr to 2 May 2021
- Largely **positive sentiment** among public and despite threats to organisers, and **high enjoyment** of participants
- **Supervised** pre-event **negative test** required
- Live linkage of NHS-wide and study test results to tickets, with consent, and **contact tracing ahead of events**
- Prospective **whole population design**; randomisation request refused
- 15 linked **cases**: **~background rates**; >50 linked cases from leisure facility nearby without risk-mitigation



- <https://www.gov.uk/government/publications/events-research-programme-phase-i-findings/events-research-programme-phase-i-findings>
- <https://journals.sagepub.com/doi/10.1177/01410768231182389>

Covid-19 Wakeup Call for Action Ready Data

Tests & Cases

All Cheshire & Merseyside (C&M) residents tested at any Pillar 2 test site and non-C&M residents tested at a C&M test site

Note: this report does not include Pillar 1 data.

Note: positivity rate calculations do not follow PHE methodology

Show Filters

Clear Filters

Filters Applied



18,274,586

Tests Completed (LFT+PCR)

2,439,026

Individuals Tested (LFT+PCR)

803,196

Individuals Tested Positive (LFT+PCR)

3.22%

LFT Case Positivity Rate (Asymptomatic)

15.04%

PCR Case Positivity Rate (Symptomatic)

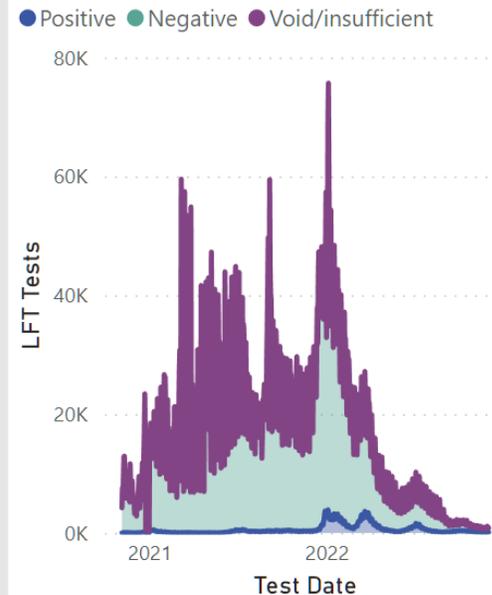
TEST COUNTS

Test Kit	Tests Completed	Positive Tests	Negative Tests	Void / Insufficient Tests
▲	406,360	21,834	369,056	15,470
LFT	13,394,612	430,575	12,948,537	15,500
PCR	4,473,614	659,790	3,726,918	86,906
Total	18,274,586	1,112,199	17,044,511	117,876

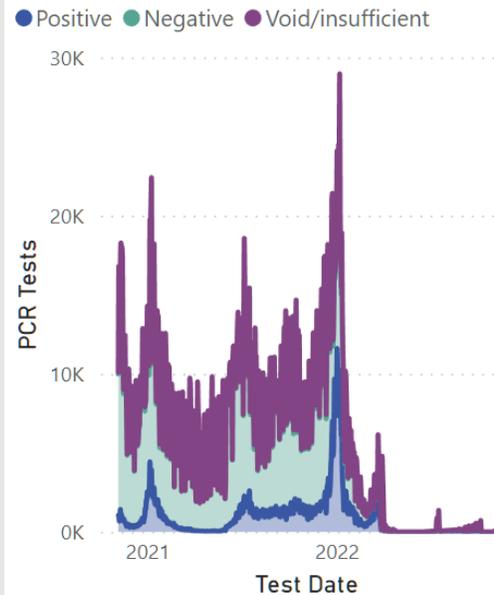
INDIVIDUALS TESTED POSITIVE

Test Kit	Individuals Tested	Individuals Tested Positive	Case Positivity Rate (Individuals)
▲	115,833	21,137	5.59%
LFT	1,666,102	315,295	3.22%
PCR	1,585,738	610,445	15.04%
Total	2,439,026	803,196	6.13%

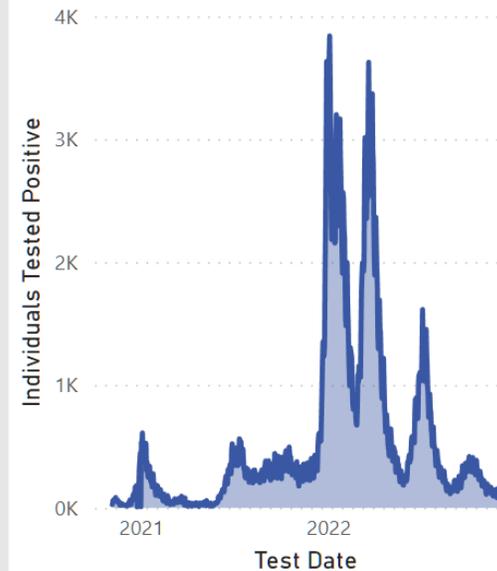
TESTS OVER TIME: LFT



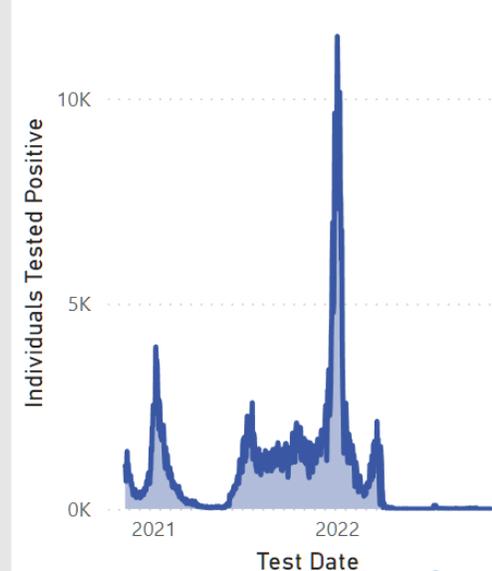
TESTS OVER TIME: PCR



INDIVIDUALS TESTED POSITIVE OVER TIME: LFT



INDIVIDUALS TESTED POSITIVE OVER TIME: PCR



Near real-time covid testing data for 2.7m people of Cheshire & Merseyside

Linked to GP and partial hospital and social care records

Dashboards for care, planning and research

NIHR Health Protection Research Unit (HPRU) in Emerging and Zoonotic Infections (EZI)

Prof Lance Turtle (Deputy Director)
(2014-2025; Dir. Tom Solomon; £10M from NIHR, £160M external funding)

Ebola



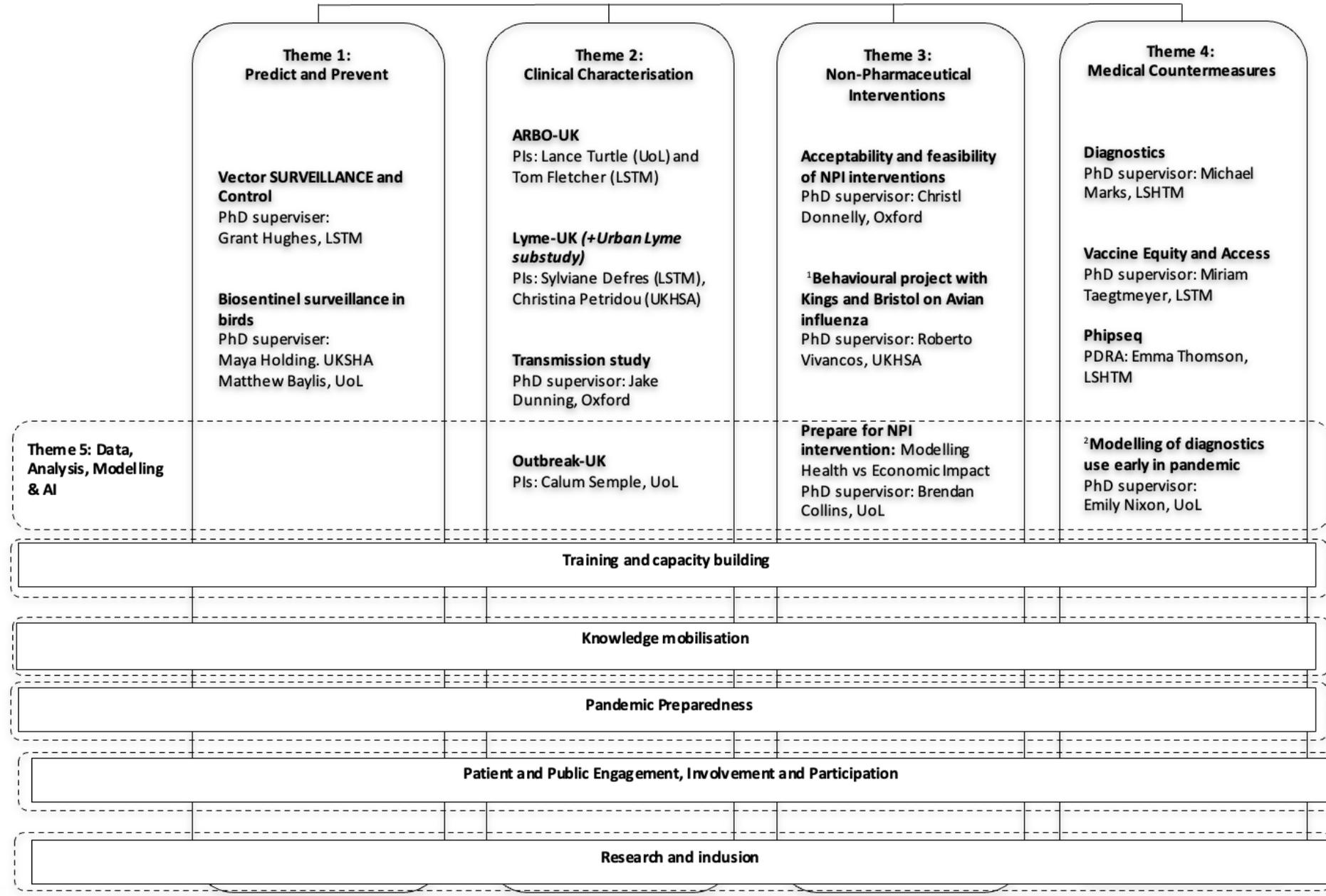
Zika



Covid-19



HPRU-EZI-III (work in progress)





THE PANDEMIC INSTITUTE

Tackling emerging infections
and pandemic threats

HPRU

Est. Sept 2021

Director: Tom Solomon CBE

The Pandemic Institute
- £20M (US\$24M)
Spine Building
- £35M (US\$42M)



The Pandemic Institute: Open for Business

Expertise, facilities and technologies for fast-track development testing and licensing of medical countermeasures



**Biosafety Level 3
Facilities - in vitro
and in vivo**



**NIHR Clinical Research Facility
Phase 1 "first in humans"**



**Accelerator Research Clinic
Phase 2/3**



**Micro-Physiological Systems
"Body on a Chip" Technologies**



Human Challenge Facility



**Access &
Inequalities Unit**

UK Pandemic Sciences Network

