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SYSTEMATIC FINAL REPORT

NIHR 158303



UNIVERSITY OF
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<https://www.liverpool.ac.uk/population-health/research/seismic-systematic/>

Systematic Final Report

Prevention, precision and equity by design for people living with multiple long-term conditions.

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1. Project Summary

Systematic is a NIHR-funded project bringing together researchers from the Universities of Liverpool and Glasgow to develop a plan to design and engineer health systems for people living with Multiple Long-Term Conditions (MLTC). The project began in January 2024 and ended in July 2025 with the ongoing engagement between the multidisciplinary teams in Liverpool and Glasgow for continuous collaboration beyond the project lifespan.

The project aimed to Transform prevention and care for people living with Multiple Long-Term Conditions (MLTCs) through systems engineering, participatory design, and continuous learning embedded in civic health and care systems. To co-design an Innovation Hub with people with lived experience, practitioners, academics, and industry partners in Liverpool and Glasgow, focusing on mental-physical health interdependence and technology validation for deprived populations. As well as deliver an action-ready plan for MLTC transformation, including a business plan and bid for further funding.

Key Focused Areas

1. Population Segments

Children & Families: Facing psychosocial and environmental challenges (e.g., mental health, obesity, asthma).

Working Life: Adults with poorly integrated mental, physical, and social care, often experiencing accelerated MLTCs.

Pre-Frailty: Older adults with MLTCs, focusing on interventions before frailty develops.

2. Equity, Prevention, and Precision by Design

Addressing health inequalities, especially in socioeconomically disadvantaged groups.

Embedding equity and inclusion principles in all activities and outputs.

3. Systems Approach

Applying systems engineering and complex systems theory to health and care challenges.

Using participatory, human-centered design to ensure solutions are relevant and sustainable.

Core Activities

- **Design Cooperative:** Convening diverse stakeholders (patients, professionals, scientists, engineers, designers) to embed MLTC data-action-research and design as core business of health and care systems.
- **People Insights:** Gathering lived experiences, developing personas, journey maps, and system maps to understand MLTC pathways and failures.
- **Health & Care Intelligence:** Using local data and practitioner knowledge to quantify MLTC pressures and trajectories, feeding into systems maps and failure scenarios.
- **Systems Futures:** Synthesizing evidence for systems methodology, optimizing services, driving innovation, and transitioning to sustainable MLTC care.
- **Workshops and Sandpit Events:** Co-defining and prioritizing problems, system elements, and solutions with stakeholders and public advisors.

2. Outputs

Publications:

[Developing SysTeMatic: Prevention, precision and equity by design for people living with multiple long-term conditions - Frances S. Mair, Farnaz Nickpour, Barbara Nicholl, Sara MacDonald, Dan W. Joyce, Jonathan Cooper, Nic Dickson, Isobel Leason, Qammer H. Abbasi, Izzettin F. Akin, Fani Deligianni, Elizabeth Camacho, Jennifer Downing, Hilary Garrett, Martina Johnston Gray, David J. Lowe, Muhammad A. Imran, Sandosh Padmanabhan, Colin McCowan, P. John Clarkson, Lauren E. Walker, Iain Buchan, 2024](#)

Presentations:

- Isobel Leason presented to Professor Lucy Chappel (CHIL visit), December 2023
- Dr Farnaz Nickpour presented to Sir Chris Whitty (CHIL visit), May 2024
- Dr Nick Dickson & Dr Sara McDonald led a participatory design workshop at North American Primary Care Research Group (NAPCRG) event in Quebec, Canada in November 2024.
- Professor Iain Buchan presented at the Cheshire and Merseyside ICB Away Day. The project was used as a case study for the event.

Animations:

[SysTeMatic | Civic Health Innovation Labs \(CHIL\) | University of Liverpool](#) This animation is created by University of Glasgow People Insights Team to highlight the challenges faced by marginalised individuals with MLTC. It tells the story of Robert, a 45-year-old in recovery who is managing MLTCs. Voiced by a member of the public, the animation provides an authentic look at the systemic and practical barriers such individuals face, illustrating the complexities of their health journeys and broader societal impacts.

Another animation is being created by University of Liverpool, with an aim to clearly explaining the lived experience of MLTC and challenges from a public perspective. This will be shared on the Digital Commons when complete.

Digital Commons:

[SysTeMatic Digital Commons](#)

Research Bid Development

Public Participation Involvement and Engagement Update

Innovative Engagement Methods:

Valuable Public Involvement:

Effective Collaboration and Atmosphere:

The workshop was described as “productive,” “collegiate,” and “ambitious.” The team worked well together, with a supportive and energetic environment that encouraged participation from all attendees. The short, focused interactions allowed for efficient progress while maintaining depth in the discussions.

Reaching Seldom-Heard Groups:

The team’s ability to engage with seldom-heard voices, such as those from the Bryn Community Hub, was seen as a significant achievement. This broadened the range of experiences and insights feeding into the project, making the outcomes more representative and equitable.

What Could Be Better

Increase Direct Interaction Across Sites:

There was a clear desire for more direct interaction between PPIE (Public Participation Involvement and Engagement) colleagues at both Liverpool and Glasgow sites. Participants felt that stronger cross-site relationships would help align goals, share learning, and build a more unified team culture.

Deeper Understanding of Contexts:

Some participants noted the need to better understand the unique contexts, challenges, and working environments of colleagues at other sites. This would help tailor approaches, foster empathy, and ensure that solutions are relevant across different settings.

Relationship and Trust Building:

Suggestions included creating more opportunities for informal conversations and social interactions. Building trust and rapport outside of formal meetings was seen as essential for deeper collaboration and more effective teamwork.

Clarity on Roles, Responsibilities, and Next Steps:

There was feedback that clearer communication about individual roles, responsibilities, and follow-up actions would help maintain momentum after the workshop. Participants wanted to ensure that everyone knew what was expected of them and how their contributions fit into the bigger picture.

Balancing Participation:

Ensuring that all voices are heard equally remains an ongoing goal. Some felt that certain perspectives dominated at times, and there is a need to actively encourage quieter participants to share their views and experiences.

We would like to express our thanks to the public advisors for their commitment and support of the project.

4. Outputs and Dissemination

The team have had the below protocol published in the Journal of Multimorbidity and Comorbidity.

[Developing SysTeMatic: Prevention, precision and equity by design for people living with multiple long-term conditions - Frances S. Mair, Farnaz Nickpour, Barbara Nicholl, Sara MacDonald, Dan W. Joyce, Jonathan Cooper, Nic Dickson, Isobel Leason, Qammer H. Abbasi, Izzettin F. Akin, Fani Deligianni, Elizabeth Camacho, Jennifer Downing, Hilary Garrett, Martina Johnston Gray, David J. Lowe, Muhammad A. Imran, Sandosh Padmanabhan, Colin McCowan, P. John Clarkson, Lauren E. Walker, Iain Buchan, 2024](#)

There are further publications being prepared on the methodological processes used in People Insights work by The University of Liverpool team, as well as a paper on the analysis from the data by the Health Intelligence working group.

The digital commons are available as an interactive resource ([SysTeMatic Digital Commons](#)). It is a place to share outcomes and updates from the SysTeMatic project, this includes resources (methods, tools, models, reports & more) focused on applying systems engineering to improve health and care for people living with Multiple Long-Term Conditions (MLTC) equitably. The goal is to support collaboration, conversation and learning about systems approaches for MLTC.

Alongside the produced animation, the University of Liverpool team is creating another film to demonstrate lived experience with MLTC. The animation is expected to launch in Jan 2026.

5. Budget

Following the no-cost extension and reprofile budget being approved by the NIHR until the end of July 2025 we have managed to allocate and spend the remaining funds according to the reprofile plan. By end of July, the University of Liverpool have approx. £5k underspend due to the delay of the production of animation. We requested the remaining 5k to be ringfenced in the University of Liverpool to support research finding dissemination and contribute to continuous PPIE work to ensure the dissemination activities. The request was approved by NIHR. The University of Glasgow has approx. 30k underspend left and may return the underspend in January 2026 when the finance audit process is completed.

6. Governance & Compliance

Governance Structure

Lead Institutions: The project was a collaboration between the University of Liverpool (main contractor) and the University of Glasgow.

Project Management

The team was organised into individual working groups (People Insights, Health & Care Intelligence, Systems Futures) that met regularly.

A Programme Management Group (PMG) met monthly to oversee project delivery, including data management and ethics, and took on additional responsibilities such as quarterly reviews of data management and ethics.

An External Advisory Board—comprising experts in data, psychiatry, civic systems, and systems engineering—met three times during the 18-month project to provide independent oversight and guidance.

Ethics Approvals

Ethics approval was granted by the University of Liverpool in August 2023 and by the University of Glasgow in October 2023.

All start-up requirements set by the National Institute for Health Research (NIHR) were completed in October 2023.

Collaboration Agreement

A formal agreement between the University of Liverpool and the University of Glasgow was completed in July 2023, outlining roles, responsibilities, and compliance expectations.

Data Management

Data management and ethics were reviewed quarterly by the PMG to ensure compliance with institutional and funder requirements.

The project adhered to strict data governance protocols, especially when handling sensitive health and participant data.

7. Risk Management

The project maintained a detailed risk register, regularly reviewed and updated, identifying potential risks (e.g., recruitment, data access, interdisciplinary barriers) and mitigation strategies.

Risks were categorised (operational, financial, reputational) and assigned levels before and after mitigation, with clear monitoring and response plans.

8. Next steps

Archival

All physical materials (e.g. consent forms, activity books) have been digitised and original hard copies securely destroyed as confidential waste.

Archiving arrangements (electronic data)

Location: University of Liverpool M: Drive in a password-protected folder. Data will not be uploaded to a public data repository or catalogue as outlined in the ethics application.

Custodian: Dr Farnaz Nickpour

Period: 10 years from the end of the study.

Future Funding Applications

The project team submitted a new bid for an EPSRC funding call titled “Research and partnership hubs for a healthy society”. The outcome is pending.

Dissemination

As mentioned above, a new animation is produced to outline the challenges of patients with lived experience of MLTC. The new animation is expected to launch in January 2026.

Papers in the Pipeline:

Submission date	Working title	Target journal
March 2026 (planned)	Health Systems Change through People-centred and Systemic Co-design; Introducing the Person-Journey-System map three-tier model to bridge the gap between description and action in complex health and care systems in MLTCs	Health Systems
March 2026 (planned)	Multimorbidity patterns in unscheduled care and associated outcomes: a data linkage study using routinely collected healthcare data	BMC Medicine

PPIE

Several Public Advisors had expressed their interest in contributing to future bids and will be included in the research bid writing stage once further suitable opportunities have been identified. The ongoing engagement include involvement in PPIE animation and future funding application opportunities.

9. Appendix

Table 1: Systematic Progress Table

Milestone	Update on Progress	Original Completion date or New Date for completion if not yet completed	Status
D1.1 Ontology: MLTC Principles & techniques	Ontology being developed – acknowledging the task is behind schedule and more difficult than anticipated; Mitigation plan: to link ontology to specific methods/techniques that are relevant to the Liverpool Systems maps (D1.4). Outputs to be migrated to the Digital Commons (now being stood up)	Nov-24	complete
D1.2 MLTC population segment profiles	Liverpool: Developed Person Maps using qualitative data and intersectional multivariate MLTC Extreme Patient Profiles have been identified providing groundwork for the Innovation Hub. Multimorbidity 'clusters' from primary care data sources (similar and comparable to those developed in Glasgow for unplanned care data) completed across 61 wards in the Mersey side region. Completed visualisations (heat maps) of morbidity patterns by population segment complete. Completed visualisations showing the interaction of geography, deprivation and "most similar comorbidity pattern". Glasgow: Once again there is overlap between epidemiology (health intelligence) and the experience (People insights) work across the 3 population segments in Glasgow which we believe is a real strength of the project. We have developed in depth profiles /descriptions of the lived experience of these different population segments, co-created with seldom heard in research, community participants.	Mar-24	complete
D1.3 MLTC personas & pathways in each segment	Liverpool: Personas have been refined to an advanced more holistic systemic version referred to as Person Maps for MLTC. These Person Map frameworks have been co-developed by patients, Public Advisors, health care providers and practitioners' input & populated and completed for each segment. Glasgow: We have developed rich and nuanced profiles through the development of personas (archetypes); reflecting the journeys of these archetypes. The quantitative data provides added insights into the pathways of population segments which complements the experiential work.	Mar-24	complete
D1.4 Systems map of pathways & bottlenecks for patients and practitioners	developed a model and a framework for MLTC journey and systems (MLTC Journey Maps & System Maps) capturing points of failure and covering pathways & bottle necks between them. These capture the complexity and nuances of actual (versus planned) MLTC patient journeys and current systems and have been populated using data captured from patients and practitioners. These will be instrumental in the problem framing and prioritisation and design, development and delivery of interventions in the hub. All work is complete on this deliverable. Glasgow: Data examined on prevalence of different LTC combinations and patterns of adults attending unscheduled care (ED) in GG&C. We have shown that people from the most socioeconomically deprived areas have a higher prevalence of combined mental-physical multimorbidity and multimorbidity that includes chronic pain. Other work ongoing is looking at outcomes for these multimorbidity types, including: reattendance at ED, mortality, place of	Sep-24	complete
D1.5 System Failure scenarios in & across segments	Liverpool: Captured through triangulated methods i.e. activity books, focus groups, workshops and interviews; and captured from multi perspectives of people with lived experience of MLTC, health sector and VCSFE sector. Glasgow: explored using participatory arts based research (PBR) approaches with the most vulnerable groups/seldom heard groups in Glasgow. Day-to-day experience of fragmented care highlight significant barriers, these problems are amplified for these groups. Particularly because of wider structural macro issues e.g. lack of access to transport, technology etc..	Mar-24	complete
D2.1 Problem definitions/priorities, systems maps for each MLTC population segment	Developed Problem Definition & Problem Prioritisation diagrams and matrices for iterative and participatory input from the ecosystem. This work closely links to deliverable 2.3 where more information can be found.	Jun-24	complete
D2.2 Evidence gap maps: emphasising opportunities for optimisation, innovation and transition.	The work is combined with the Problem Prioritisation Canvas (D2.1) which maps priorities and opportunities across optimisation, innovation and transition.	Nov-24	complete
D2.3 System maps for population segments	Liverpool: Developed MLTC system map frameworks & populated an overall system map labelling points as relevant to all/specific population segments. These systems maps acknowledge multiple system building blocks and assets, and include matrices distinguishing where and how to intervene in the system. These have been co-developed and subsequently co-populated with input from NHS (Cheshire and Merseyside Integrated Care Board) and have been deemed as highly relevant and potentially valuable to ICB work on identifying, prioritising and strategising multimorbidity work going forward.	Jun-24	complete
D3.1 MLTC learning system framework with actionable examples in each population segment.	First workshop complete on 23.09.24, an initial framework, outlining Work Packages, Pillars and the hub design and evaluation processes has been established. 2 further workshops are planned to iterate framework and develop actionable examples, in Oct/Nov. This will go through another round of iteration receiving input from the wider ecosystem of health and social care in Liverpool and Glasgow, through running 2 sandpit events respectively.	Dec-24	complete
D4.1 Business plan for MLTC action research and design as core business of two health & care systems in England and Scotland.	Sandpit events completed, partners engaged in bid.	Dec-24	complete
D4.2 Bid for NIHR Systematic MLTC Innovation Hub.	Bid submitted 30.01.2025. The outcome of the bid for stage 2 work is unsuccessful. The team then submitted a new bid for an EPSRC research and partnership hubs for a healthy society.	Jul-25	complete

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