

By



Professor Iain Buchan

Associate Pro Vice Chancellor for Innovation and W.H. Duncan
Professor of Public Health Systems,
University of Liverpool

W.H. Duncan Professor of Public Health Systems, Associate Pro Vice Chancellor for Innovation, and Director of Civic Health Innovation Labs (CHIL) at University of Liverpool. Public health physician and data scientist with over 25 years of experience in public health and data science. He has led over £250m in research activity and published over 360 works including software and patents. He led the world's first evaluation of mass rapid antigen testing, risk-mitigated reopening of mass events for UK COVID-19 responses. He founded the UK's first Civic Data Cooperative and leads data science and AI research focused on global challenges of antimicrobial resistance, pandemic preparedness, mental health, medicines optimization, multimorbidity and health system resilience. Qualified in pharmacology, medicine, public health, statistics, and informatics, he is a Fellow of American College of Medical Informatics, National Institute for Health and Care Research Senior Investigator, recipient of Faculty of Public Health Alwyn-Smith medal and Royal Statistical Society Florence Nightingale Award.

Explore more from
The Kyndryl Institute
kyndryl.com/institute

Shifting the focus of healthcare

from consultations to conversations – an AI prescription for prevention

Prevention has long been the rallying cry of health and care policymakers and planners, yet the global burden of chronic disease has never been greater.

In 2025, one in nine of the world's adults has diabetes – 90% caught in a rising tide of type 2 diabetes after decades of poor diet (“over malnutrition”), underactivity, and obesity.¹ This failure of preventive healthcare contributes to roughly 640 million people worldwide living with cardiovascular disease.² Beyond physical illness, mental health problems are also on the rise³ – harming physical health,⁴ social wellbeing and the ability to work. Increasing numbers of people live with two or more long-term conditions – especially older adults and communities facing socioeconomic adversity, where combinations of chronic conditions can appear 10-15 years earlier than in more affluent communities.⁵

This is not just a public health crisis; it's also an economic one. When such combinations appear in working-age people, the financial pressure on society intensifies. In many countries, people are living longer but spending more of their life in ill health, taking more time off work and having fewer children. An older, less productive workforce – together with pressure on pension funds and social care – deepens the economic strain. In the UK, the Office for Budget Responsibility now emphasizes the need

for improving public health and worker productivity to underpin the wider economy.

At the same time, treatments continue to advance – especially medicines discovery and development, aided by AI. Yet 30-50% medicines are not taken as prescribed – leading to substantial harm and waste.⁶ For long-term conditions such as type 2 diabetes, optimal outcomes depend on complementary interventions, for example in diet and physical activity. There is a profound need for technologies – such as conversational AI and biosensors – that can tap into the rhythms of our lives and support healthier habits, including optimal diet, exercise, sleep and medication use.

The HealthTech sector is booming, but consumer products for the “worried well” do not deliver the preventive healthcare society needs. The global market for healthcare wearables alone is due to reach \$250 billion by 2030.⁷ Most of these devices – and the rich data they generate – do not interoperate with medical records,⁸ and even if they did, infrequent consultations between patients and clinicians cannot reshape the daily choices that prevent or reduce illness. Healthcare must refocus from sparse consultations to continuous, impactful conversations – advances in conversational and multi-agent AI are ripe for this shift.

A move toward patient-centered “conversational healthcare” could also better integrate care across conditions, improving safety, effectiveness and value for money. For example, common medications for serious mental illness cause obesity, high blood pressure, diabetes, kidney disease, heart attacks and strokes. Patients may see psychiatrists, cardiologists, diabetes and kidney specialists, and primary care physicians – yet still die, on average, 20 years earlier than the rest of society due to lack of day-to-day support for their mental and cardiometabolic health.⁹ Similarly, depression is common among patients with diabetes, chronic lung disease, and chronic kidney disease, affecting their use of medicines and self-care. There is a long-neglected need to refocus digital health innovation from “medicine as usual” toward a more integrative “health-avatar”

approach where frequent patient interaction creates more timely, holistic and preventive insights.¹⁰

Recent advances in generative AI (GenAI) and large language models (LLMs) have spawned conversational agents that interact by voice in thousands of languages and dialects. These are rapidly becoming the standard interface for public access to services – for example across India’s banking sector. Voice interaction is a critical opportunity for healthcare because it can overcome literacy barriers – general, digital and health literacy alike – that often block vulnerable patients from using HealthTech designed around reading and typing.



Healthcare must
refocus from sparse
consultations to continuous,
impactful conversations –
advances in conversational
and multi-agent AI are
ripe for this shift.

Lowering these barriers is key to shifting health systems toward prevention as they face growing care needs, widening inequalities, and limited resources. Healthcare AI must be designed with equity in mind. The evolution of “read-type/text” into “listen-talk/voice” interaction promises greater accessibility, while multi-agent AI offers new ways to target health and social care resources to those individuals and families in greatest need, coordinating care across providers for earlier, more integrated, and preventive intervention.

We are at a tipping point where emerging AIs could turn the vision of *learning health systems* into reality.¹¹ My colleagues and I at the University

of Liverpool's Civic Health Innovation Labs (CHIL), working with UK health systems and industry partners, are building a three-level learning system, with continuous feedback loops linking the patient, provider and population levels. The disruptive data and decisions in this model are expected to emerge from daily conversations between patients and AI.

Why patients and families need smoother journeys not just better pitstops of care

Consider Lucy's journey. At 55, Lucy manages multiple long-term conditions – fibromyalgia, type 2 diabetes, chronic kidney disease, post-traumatic stress disorder, chronic pain and poor sleep – while also caring for a husband with dementia. Her health and caregiving responsibilities limit her ability to work, creating financial hardship. She recently lost her part time job at a local shop. Her aggressive medication regimen helps in some ways but leaves her with gut issues, brain fog and anxiety about adherence.

The apps and devices Lucy uses to monitor her conditions and manage her treatments do not talk to each other. She searches online for help and finds conflicting advice. Her fluctuating energy levels keep her homebound, worsening her mental health and further limiting her ability to work.

Lucy is not an exception – 15 percent of people in England live with two or more long-term conditions.¹²

Yet, she feels unsupported. Long waits, fragmented care and dismissive encounters leave her confused and unheard. Her GP means well but is bogged down by administrative tasks and poor communication with specialists. They rarely have time to reflect on what is working and what isn't. Both would benefit from a system that listens, learns, and adapts.

How conversational care in a learning health system could help

The “X-factor” of the learning health system is a multi-agent framework that generates, consumes, and shares data across three levels of interaction: patient, provider, and population.

A patient-level agent supports Lucy in managing her medicines and logs her food intake, exercise, sleep, work and social activities. She prefers to interact with her AI “ally” via a smart speaker in her kitchen that recognizes her via radar body-mapping and checks she is alone to speak privately. The agent helps her reflect on symptoms, flags when to seek help, supports her to use self-test kits, reminds her to take medications, helps her to find digital therapies, and makes notes with her to prepare for consultations.

A provider-level agent aggregates data from Lucy's agent and clinical records, creating more comprehensive information for her care team – summarized



in one timeline noting key changes in symptoms, clinical observations, test results and treatments. It overlays risk calculations and management guidelines to support shared decision-making. Decisions may include stopping a medication that is doing more harm than good, which only became apparent through Lucy's symptom and sleep data.

A population-level agent interacts with privacy-compliant data from Lucy's agent and her providers' agents to help system managers target resources for optimal benefit and value. It might trigger an early medication review, flag community dementia support for her husband, or identify a trial of a new pain therapy. With better coordinated support, Lucy resumes work and regains the social connections that improve her mental health, sleep and wellbeing.

These three levels create a continuous learning system. Patients become more proactive, providers more adaptive, and health systems more capable of targeting resources, improving outcomes, reducing waste, and generating and using research evidence.

How to get the flywheels turning – and learning systems as a network?

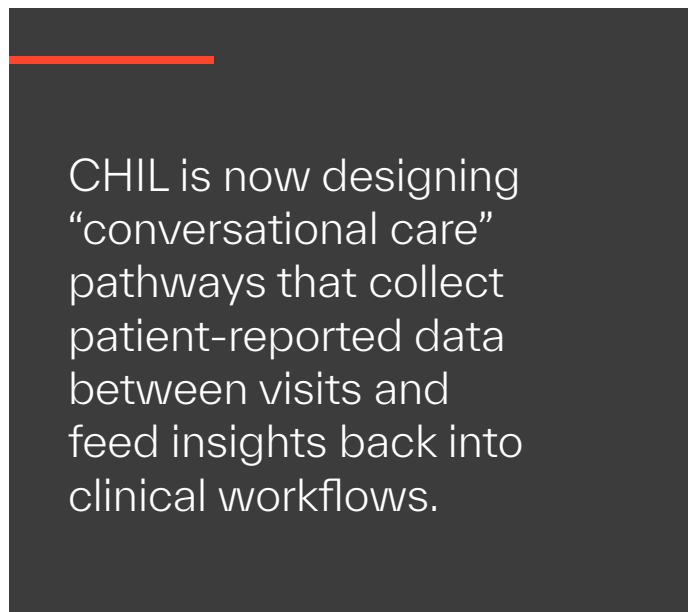
Ideally, progress in one health system should enable others to co-learn – via shared algorithms, data, evaluation, and training. Engineering and validating such a federated learning network is complex.

This is the work my colleagues and I pursue at the University of Liverpool's Civic Health Innovation Labs (CHIL).¹¹

CHIL emerged from Liverpool's data-driven responses to COVID-19. The city pioneered the world's first voluntary mass testing using lateral-flow devices, cutting severe COVID-19 hospitalizations by a quarter.¹³ This success relied on strong community participation – one in four residents volunteered within a month – and progressive data sharing. The Liverpool City Region Civic Data Cooperative, the first of its kind in the UK, recently co-produced a Community Charter on Data and AI with residents, calling for trustworthy innovation.

Responding to the rising tide of mental health conditions, CHIL also hosts a demonstrator site for the UK's *Mental Health Mission* – www.MRIC.uk, which includes engineering “mental health avatars” and learning systems. In a city where a third of children are born into poverty and many families face multiple adversities, this innovation is essential, not optional. Across the wider 2.7 million-population health system of NHS Cheshire and Merseyside, the 8 percent of households with children facing the greatest socioeconomic adversity consume around 34 percent of the region's NHS and social-care resources.¹⁴

CHIL is now designing “conversational care” pathways that collect patient-reported data between visits and feed insights back into clinical workflows. For example, in new clinics for treatment-resistant depression at Mersey Care NHS Foundation Trust, linked to MRIC, patients use apps to record sleep and daily experiences. AI then summarizes these patterns for clinicians. At the provider level, natural-language processing and large language models analyze both app and clinical-record data to uncover, for example, why certain therapies were or were not prescribed, how confident clinicians felt, and what alternatives might carry lower risk. The learning and algorithms will be shared nationally through the National Institute for Health and Care Research (NIHR) Mental Health Translational Research Collaboration, supported by the new national Mental Health Secure Data Environment hosted in Liverpool.



CHIL is now designing “conversational care” pathways that collect patient-reported data between visits and feed insights back into clinical workflows.

Maximizing the global impact of conversational care and learning systems

The ultimate goal is a global network of learning health systems, advancing preventive care and population health through insights drawn from diverse populations, environments, and care contexts. Small but significant steps toward this vision are being taken in the UK, aligning national data and AI initiatives with local health system innovation.

Data from around the world underscore the urgency: while life expectancy is rising, the number of years spent in good health and productive work is falling. Economies cannot sustain healthcare in its current form.

We must transform healthcare from rare consultations to continuous conversations focused on prevention. This transformation will not be achieved solely by speeding up the translation of discoveries into treatments but by connecting multiple evolving AIs – dynamic systems that learn continuously from interactions with patients, care providers, system managers and public health officials. Building such systems is as much a cultural and organizational challenge as a technical one.

Policymakers and health-system leaders need to strengthen advocacy for prevention by championing AI systems that serve diverse needs. Providers, governments, and technology companies must collaborate on data sharing, formative regulation, and the adoption of preventive HealthTech.

Conversational and multi-agent AI technologies are ready to advance preventive healthcare – and the need has never been greater. What remains is the collective will to make prevention standard practice, improving lives and economies through health systems that continuously learn from their data. —



References

- 1 Facts & Figures, International Diabetes Federation, accessed September15
- 2 Global Cardiovascular Disease Factsheet, British Heart Foundation, August 2025
- 3 GBD 2019 Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study. *The Lancet Psychiatry* 9, 137-150 (2019). DOI: 10.1016/S2215-0366(21)00395-3
- 4 Levine, G.N., Cohen, B.E., Commodore-Mensah, Y., et al. Psychological Health, Well-Being, and the Mind-Heart-Body Connection: A Scientific Statement From the American Heart Association. *Circulation* 10, e763-783 (2021). DOI: 10.1161/CIR.0000000000000947
- 5 Skou, S.T., Mair, F.S., Fortin, M., et al. Multimorbidity. *Nat Rev Dis Primers*. 8, 48 (2022). DOI: 10.1038/s41572-022-00376-4.
- 6 Khan, R. and K. Socha-Dietrich, Investing in medication adherence improves health outcomes and health system efficiency: Adherence to medicines for diabetes, hypertension, and hyperlipidaemia. OECD Health Working Papers, No. 105, OECD Publishing, Paris, DOI: 10.1787/8178962c-en
- 7 Wearable Medical Devices Market Size, Share & Trends Analysis Report By Product (Diagnostic, Therapeutic Devices), By Site (Handheld, Headband, Strap, Shoe Sensors), By Application, By Region, And Segment Forecasts, 2025 - 2030, Grand View Research
- 8 Chandrasekaran, R., Sadiq, T. M., Moustakas, E., Usage Trends and Data Sharing Practices of Healthcare Wearable Devices Among US Adults: Cross-Sectional Study. *J Med Internet Res* 27, e63879 (2025). DOI: 10.2196/63879
- 9 Firth, J., Siddiqi, N., Koyanagi, A., et al. The Lancet Psychiatry Commission: a blueprint for protecting physical health in people with mental illness. *Lancet Psychiatry* 6 675-712 (2019). DOI: 10.1016/S2215-0366(19)30132-4
- 10 Buchan I, Winn J, Bishop C. A unified modelling approach to data intensive healthcare. in *The fourth paradigm: data-intensive scientific discovery*. Eds Hey T, Tansley S, Tolle K. Microsoft Research 2009. www.microsoft.com/en-us/research/wp-content/uploads/2016/02/4th_paradigm_book_part2_buchan.pdf
- 11 <https://www.thenhsa.co.uk/app/uploads/2025/03/National-Grid-of-Civic-Learning-Systems-NHSA-and-partners.pdf>
- 12 Valabhji J, Barron E, Pratt A, et al. Prevalence of multiple long-term conditions (multimorbidity) in England: a whole population study of over 60 million people. *Journal of the Royal Society of Medicine*. 117, 104–117 (2024). DOI:10.1177/01410768231206033
- 13 <https://covid19.public-inquiry.uk/documents/inq000587241-witness-statement-of-professor-iaian-buchan-dated-31-03-2025>
- 14 Piroddi, R., Astbury, A., Baker, W., et al. Identifying households with children who have complex needs: a segmentation model for integrated care systems. *BMC Health Serv. Res.* 25, 152 (2025). DOI: 10.1186/s12913-024-12100-x.