

CASE STUDY

The potential of home environment sensors in health care and housing management

2016 - present

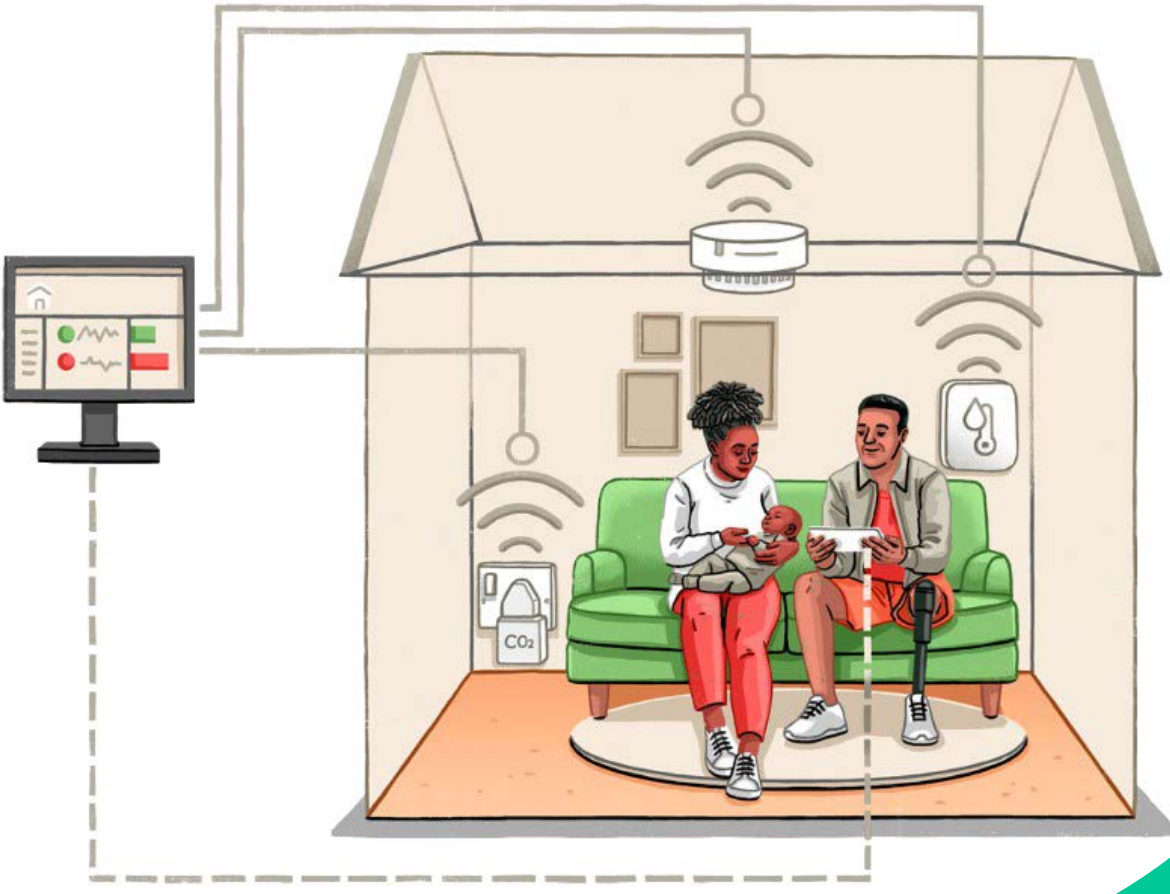
University of Exeter | Environment and Sustainability Institute

RESEARCH DIGEST

For more than eight years, a multidisciplinary team of researchers at the University of Exeter has been developing home sensor systems to better understand and support communities, their health and their wellbeing. Through a series of projects – Smartline, Sensewell, CommunitySense and SystemSense – the team's research has evolved from exploring how digital technology can support communities to investigating how the home environment influences health and wellbeing, and how technology can help identify and address potential risks.

The work began with Smartline, a collaboration between academics from the European Centre for Environment & Human Health (ECEHH), the Environment and Sustainability Institute (ESI) and the University of Exeter's Business School, alongside Coastline Housing. Together, they installed sensors in more than 200 homes across Cornwall to monitor factors including air quality, humidity, temperature, and water and energy use. Residents also completed surveys, giving researchers valuable insights into their health, wellbeing and community needs.

Working with a wide range of partners, including Coastline Housing, Cornwall Council, Volunteer Cornwall, Age UK Cornwall and Isles of Scilly, Cornwall Council Public Health and NHS Leatside Health Centre, the team has built a substantial dataset capturing conditions within people's homes. This data has enabled researchers to develop predictive models with the potential to identify environmental factors associated with health risks and help inform interventions to improve health and wellbeing.



IMPACT

Informing local policy

The Smartline sensor dataset (2017–2023) is publicly available and has informed NHS and Cornwall Council's Technology Enabled Independence Strategy 2025–2028 and its heating strategy within the Cornwall and Isles of Scilly Local Area Energy Plan. The team has continued its partnership with the council through Sensewell and SystemSense.

Improving health and housing

Researchers developed predictive models using home sensor data to identify potential mould risks, finding an association between mouldy odours and increased asthma risk among residents. This work demonstrates the potential for sensors to help housing providers identify property-related risks and support public health services in developing targeted interventions.

Supporting innovation and industry practice

In partnership with Aico HomeLINK and HACT, the team produced The Social Value of Sensor Systems: An Introductory Guide, providing a framework for evaluating the social value of sensor technology in housing. Cornwall Council has already used the guide to inform policy development.

Influencing national policy

In 2025, researchers contributed written evidence to the UK Government's Housing, Communities and Local Government Committee inquiry into housing conditions in England, bringing research insights into national discussions on housing and health.

Contributing to research on connected homes

In 2026, the Disruptive Innovators Network published If Homes Could Talk, a literature review on connected home technologies that references several Smartline publications, highlighting the project's contribution to emerging research in this field.



PUBLICATIONS

Walker, T., Buckingham, S. A., Poole, R., Elliott, L. R., Menneer, T., Tu, G., & Morrissey, K. (2024). Telephone-Based Training Intervention for Using Digital Communication Technologies for Social Housing Residents During the COVID-19 Pandemic: Mixed Methods Feasibility and Acceptability Evaluation. JMIR Formative Research, 8. https://doi.org/10.2196/45506

Walker, T., Buckingham, S., Menneer, T., Tu, G., Elliott, L. R., Mueller, M., Leyshon, C., Leyshon, M., Pratto, L., Bland, E., & Morrissey, K. (2024). Indoor environment sensor systems for healthier homes: A feasibility study in social housing. Housing and Society, 51(3), 260–286. https://doi.org/10.1080/08882746.2024.2386480

Menneer, T., Mueller, M., & Townley, S. (2023). A cluster analysis approach to sampling domestic properties for sensor deployment. Building and Environment, 231(110032). https://doi.org/10.1016/j.buildenv.2023.110032

Menneer, T., Mueller, M., Sharpe, R. A., & Townley, S. (2022). Modelling mould growth in domestic environments using relative humidity and temperature. Building and Environment, 208(108583).. https://doi.org/10.1016/j.buildenv.2021.108583

Tu, G., Morrissey, K., Sharpe, R. A., & Taylor, T. (2022). Combining self-reported and sensor data to explore the relationship between fuel poverty and health well-being in UK social housing. Wellbeing, Space and Society, 3(100070). https://doi.org/10.1016/j.wss.2021.100070

Menneer, T., Qi, Z., Taylor, T., Paterson, C., Tu, G., Elliott, L. R., Morrissey, K., & Mueller, M. (2021). Changes in domestic energy and water usage during the UK COVID-19 lockdown using high-resolution temporal data. International Journal of Environmental Research and Public Health, 18(13). https://doi.org/10.3390/ijerph18136818

Paterson, C. A., Sharpe, R. A., Taylor, T., & Morrissey, K. (2021). Indoor PM2.5, VOCs and asthma outcomes: A systematic review in adults and their home environments. Environmental Research, 202(111631). https://doi.org/10.1016/j.envres.2021.111631

Menneer, T., Walker, T., Spooner, K., Bland, E., Pratto, L., Wellaway, I., England, M., Sharpe, R. A., Leyshon, C. & Mueller, M. (2026). Detecting changes in health and daily activities using environmental and electricity sensors and machine learning. Health and Technology. https://doi.org/10.1007/s12553-026-01082-x

ENGAGEMENT

2024 | Chartered Institute for Housing: Blog article titled "Using sensor systems to deliver healthier housing."

2024 | Housing Technology Magazine: Article in Issue 102 titled "New social value guides to home sensors."

2024 | Caravan Industry & Park Operator Magazine: Article titled "Exploring the Social Value of Home Sensor Systems."

2024 | Local Authority Building & Maintenance Magazine: Article titled "Researchers develop toolkit to harness social value of smart homes IoT."

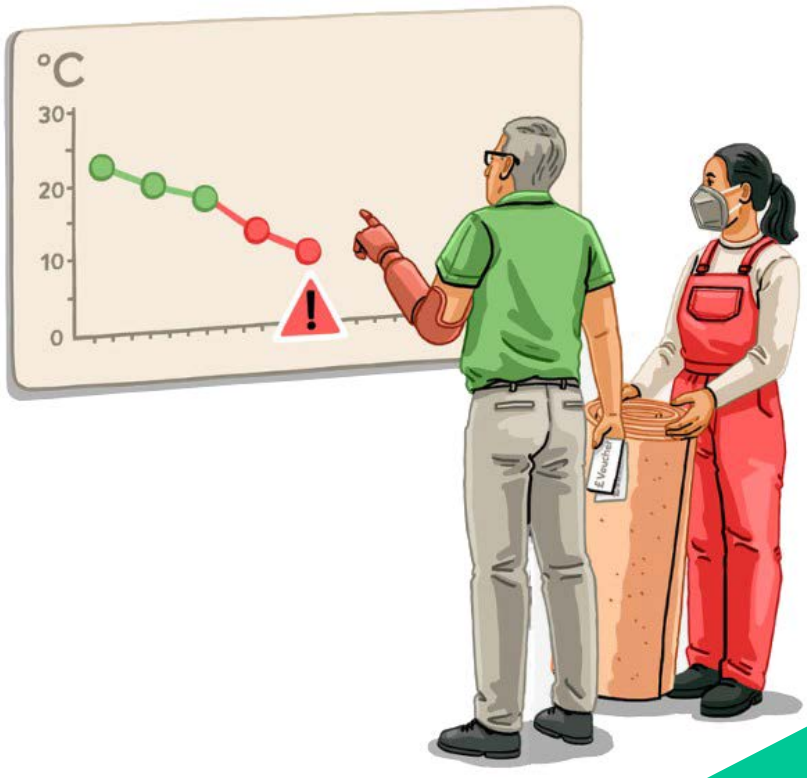
2024 | Planning, Building & Construction (PBC) Today: Article titled "Impact of IoT in social housing revealed by University of Exeter research."

2024 | Electrical Contracting News: Article titled "The University of Exeter unveils the impact of IoT in social housing."

2024 | Housing Digital Magazine: Article titled "University of Exeter research unveils impact of IoT in social housing."

2024 | Installer Online: Article titled "University of Exeter research unveils impact of IoT in social housing."

2025 | Housing Quality Magazine: Article titled "Can indoor environmental sensor systems help support healthy homes?"





TEAM

(Team members that are/ were part of the ESI)

- Prof Markus Mueller
- Dr Tamaryn Menneer
- Prof Stuart Townley

POLICYMAKER

- Regional
- National

GEOGRAPHY

- West Cornwall (direct impact)
- Cornwall and England (policy impact)

RELEVANT SDGs



FUNDERS AND PARTNERS

- European Regional Development Fund
- South West Academic Health Science Network
- Volunteer Cornwall
- Coastline Housing
- Age UK Cornwall and Isles of Scilly
- Cornwall Council Public Health
- NHS Leatside Health Centre
- Health and Environment Public Engagement Group
- Engineering and Physical Sciences Research Council (EPSRC)
- National Institute for Health and Care Research (NIHR)