

# RESILIENT: Using predictive approaches to manage people with long-term conditions at risk of dementia.

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<b>Registration date</b> 23/08/2024	<b>Overall study status</b> Ongoing	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 10/09/2024	<b>Condition category</b> Other	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

This study addresses the growing demand for social care among older adults, particularly those with multi-morbidities, which significantly increase healthcare costs and hospital stays. By using advanced technologies like the Internet of Things (IoT) and wearable devices, the study aims to develop machine learning models to predict health deterioration and cognitive decline, such as dementia, in people aged 65 and over with multiple chronic conditions. The ultimate goal is to create a sustainable framework for continuous, individualised care and timely interventions.

### Who can participate?

Adults aged 65 years and over who are living with two long-term conditions (multi-morbidities) are eligible to participate in this study.

### What does the study involve?

Participants will use in-home monitoring devices that the data will be used to develop and test machine learning algorithms for predicting health deterioration. The study also involves health and wellbeing assessments, generating health reports for care teams, monitoring carer stress levels, and surveys to gather opinions on remote health monitoring from clinicians and the public.

### What are the possible benefits and risks of participating?

#### Benefits:

- Improved health monitoring and management through personalised care.
- Potential delay in the progression of cognitive decline and dementia.
- Enhanced understanding and involvement in personal health data usage.

#### Risks:

- Privacy concerns related to continuous monitoring.
- Potential technical issues with the in-home devices.
- Data accuracy and reliability challenges due to varying environmental and individual factors.

Where is the study run from?

Surrey and Borders Partnership NHS Foundation Trust (UK)

When is the study starting and how long is it expected to run for?

November 2022 to October 2025

Who is funding the study?

Engineering and Physical Sciences Research Council (EPSRC) and National Institute for Health and Care Research (NIHR) (UK)

Who is the Main Contact?

Professor Ramin Nilforooshan  
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## Contact information

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## Additional identifiers

### EudraCT/CTIS number

Nil known

**IRAS number**

321104

**ClinicalTrials.gov number**

Nil known

**Secondary identifying numbers**

IRAS 321104, CPMS 55166

## Study information

**Scientific Title**

PREdictive approachES in managinG people with Long-term condItions at risk of dEmeNTia: from remote monitoring data to digital biomarkers: a feasibility study

**Acronym**

RESILIENT

**Study objectives**

To build upon our work in dementia, this feasibility study will examine the feasibility of adults aged over 65 with multi-morbidities accepting and using in-home monitoring devices. We will explore whether sufficient data can be gathered to begin the development of machine learning algorithms which could be used as the building blocks to predict health deterioration, including cognitive decline indicative of dementia, in a larger future study. This feasibility study aims to begin the development of a sustainable framework to integrate and evaluate the applicability of algorithmic and engineering developments in managing multi-morbidities such as ageing-associated conditions and how these might lead to dementia. Future work will evaluate this framework based on: performance, accuracy, generalisability, and explainability of the models. The continuous analysis of the in-home monitoring data will allow for more rapid and accurate predictive risk analysis, condition and symptom management, and timely interventions based on personalised models in healthcare.

**Ethics approval required**

Ethics approval required

**Ethics approval(s)**

Approved 30/06/2023, London-Surrey Borders Research Ethics Committee (Equinox House, City Link, Nottingham, NG2 4LA, United Kingdom; +44 207 104 8057; surreyborders.rec@hra.nhs.uk), ref: 23/LO/0443

**Study design**

Prospective interventional feasibility study

**Primary study design**

Interventional

**Secondary study design**

Non randomised study

**Study setting(s)**

Home

## Study type(s)

Prevention

## Participant information sheet

See outputs table

## Health condition(s) or problem(s) studied

Predict health deterioration in people aged 65 years and over who are living with multiple morbidities.

## Interventions

Intervention Arm:

Enrolment:

- Participants aged 65 and over with two or more chronic health conditions are recruited.
- Participants undergo an initial baseline visit where the study's details are explained, and informed consent is obtained.

Installation of Equipment:

- Participants receive a package of passive monitoring devices (such as smartwatches, sleep analysers, and weighing scales).
- The RESILIENT Research Assistant assists with the installation of these devices in the participants' homes, ensuring they understand how to use them.

Monitoring and Data Collection:

- Over the course of 24 months, data is continuously collected from the in-home devices.
- Participants complete health questionnaires with a research assistant at different intervals to monitor their physical and mental health.

Health Reports:

- The data collected from the devices and questionnaires is compiled into health summary reports by the RESILIENT research team.
- These reports are shared with the participants and their healthcare providers for review and potential clinical intervention.

Follow-up:

- Participants are monitored for the entire duration of the study (24 months).
- Any suspected deterioration in health, particularly in cognition or mental health, is highlighted for the participant's usual care team to address.

Survey Arm:

Enrolment:

- Participants with long term health conditions, People who support someone with a long term health condition, or people who work as a clinical professional aged 18+

Survey:

- Anonymous online survey (~10 minutes) completed via Qualtrics

## Intervention Type

Device

## Pharmaceutical study type(s)

Predictive digital biomarkers

## Phase

Not Applicable

**Drug/device/biological/vaccine name(s)**

Withings Sleep Matt for analysis, Withings Smart Watch, Withings Weighing Scales

**Primary outcome measure**

Feasibility of data collection from in-home devices and health assessments to inform the creation of machine learning models to predict health deterioration in people aged 65 and over who are living with multiple morbidities Measured by review of data completeness from in-home devices and health assessments throughout the 24-month study period, with continuous data collection

**Secondary outcome measures**

1. Health Report Feedback collected from the participant's care team regarding the health reports generated at regular intervals when reports are generated (weekly or aggregated over three months)
  2. Carer Stress Levels measured using Questionnaires and data from in-home devices assessing carer stress levels continuously during the 24-month study period
  3. Public and Clinician Survey on Remote Monitoring measured using an Online survey conducted with clinicians and members of the public.
- It is a one off 10 minute survey at any point during the study

**Overall study start date**

01/11/2022

**Completion date**

01/10/2025

## **Eligibility**

**Key inclusion criteria**

1. Age: 65 years and over
2. Have at least two long-term health conditions. This will include but is not limited to:
  - 2.1. Arthritis
  - 2.2. Chronic Kidney Disease
  - 2.3. Chronic Obstructive Pulmonary Disease
  - 2.4. Heart Disease or Failure
  - 2.5. Depression
  - 2.6. Diabetes
  - 2.7. Hypertension
  - 2.8. Liver disease
  - 2.9. Stroke
  - 2.10. Mental Health Disorders
3. Capacity to consent

**Participant type(s)**

Patient

**Age group**

Senior

**Lower age limit**

65 Years

**Upper age limit**

100 Years

**Sex**

Both

**Target number of participants**

500 (public survey) 75 (intervention)

**Key exclusion criteria**

1. People with an unstable mental state including severe depression, severe psychosis, agitation and anxiety
2. People with severe sensory impairment
3. People who are receiving treatment for terminal illness at baseline (life expectancy less than 6 months or recognised as being in their last year of life)
4. People who lack capacity

**Date of first enrolment**

01/10/2023

**Date of final enrolment**

31/03/2025

**Locations****Countries of recruitment**

England

United Kingdom

**Study participating centre**

**Surrey and Borders Partnership NHS Foundation Trust**

Research and Development

Two Bridges

Chertsey

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**Sponsor information****Organisation**

Surrey and Borders Partnership NHS Foundation Trust

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**Sponsor type**

Hospital/treatment centre

**Website**

<https://www.sabp.nhs.uk/>

**ROR**

<https://ror.org/00f83h470>

**Funder(s)****Funder type**

Research council

**Funder Name**

Engineering and Physical Sciences Research Council

**Alternative Name(s)**

UKRI Engineering and Physical Sciences Research Council, Engineering and Physical Sciences Research Council - UKRI, Engineering & Physical Sciences Research Council, EPSRC

**Funding Body Type**

Government organisation

**Funding Body Subtype**

National government

**Location**

United Kingdom

**Funder Name**

National Institute for Health and Care Research

**Alternative Name(s)**

National Institute for Health Research, NIHR Research, NIHRresearch, NIHR - National Institute for Health Research, NIHR (The National Institute for Health and Care Research), NIHR

**Funding Body Type**  
Government organisation

**Funding Body Subtype**  
National government

**Location**  
United Kingdom

## Results and Publications

**Publication and dissemination plan**  
We will publish the findings, methods and approaches developed in the study in peer-reviewed conferences and journals. The intention is to create wider awareness and disseminate the findings and innovations of the study.

**Intention to publish date**  
31/10/2026

**Individual participant data (IPD) sharing plan**  
We plan to publish fully anonymised data available in a public repository. This is currently a plan, but in the past, we have deposited the data on Zenodo

**IPD sharing plan summary**  
Stored in publicly available repository

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Participant information sheet</a>	version 4.0	19/04/2024	16/08/2024	No	Yes
<a href="#">Participant information sheet</a>	Participant Information Leaflet version 1.0	12/10/2023	16/08/2024	No	Yes