



THE HOWZ (SMART METER) PROJECT

A planned service evaluation pilot study using smart analytics to monitor changes in the functional ability in the daily lives of older adults

Report by the Centre for Primary Care Research at De Montfort University

Funded by the East Midlands Academic Health Science Network

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June 2023



CENTRE FOR PRIMARY CARE
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ACKNOWLEDGEMENTS

This report could not have been written without input from a variety of people including health care staff, community and business organisations and carers of people who were approached to participate in this study. Thank you for taking the time to give your invaluable reflections, insight and feedback. The discussions held gave a deeper understanding of the challenges of recruiting onto the planned health monitoring research and highlighted important issues for researchers to learn from when recruiting older adults onto this type of research study.

Finally, we are immensely grateful to the East Midlands Academic Health Science Network for the funding, which made this project possible.

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1: INTRODUCTION

1.1 Project overview

The proposed research study using mixed methods was to monitor the electricity use of older people who lived alone in their own home using an existing smart meter app, to identify short term anomalies and changes in their electricity usage as this could indicate a change in the older adult's daily living activities or care needs. If changes were to be detected the older adult's next of kin or carer would be alerted by the app. The aim of the research therefore was to ensure early intervention in any arising issues, to stop them escalating and ensuring the older adult received the correct amount of care and support whilst at home.

1.2 Rationale for the study

In 2019 9.1% of the world's population were aged 65 and over with predictions that this will continue to rise (United Nations 2019). Within the UK the older adult population is also rapidly growing (Office for National Statistics 2022a). The recent UK census found that 18.6% of people living in England and Wales were aged 65 and over (Office for National Statistics 2022b). This demographic is more likely to be frail and have multiple health needs, including multimorbidity where the person is living with two or more health illness (Salive 2013, Villacampa-Fernandez et al 2017, Wha Lee et al 2022). The risks of having multi morbidity is known to increase with aging and being socially deprived (Barnett et al 2012). Within England older adults experiencing multi- morbidity is predicted to increase by 2035 (Kingston et al 2018). It is thought that older people living longer with frailty and multi health needs will increase pressure on services and fiscal budgets (Government Office for Science 2016, Office for National Statistics 2018). Healthcare in particular faces challenges due to the aging population (Yarnall et al 2017, World Health Organization 2022, Hernandez et al 2022, Wha Lee et al 2022). Having multiple morbidities increases costs attributed to health care and increases the use of primary and secondary health care services (National Institute for Health and Care Research 2021). To try and alleviate some of the identified pressures policy across health and social care is evolving. The House of Lords (2017) avers that service transformation across adult social care and the NHS needs to include innovative technologies. Technology has revolutionised health care to enable people to live longer and healthier life's (Saher and Anjum 2021). Part of the NHS long term plan for example (2019) is to prevent unnecessary hospital admissions and recognises that technology has a use in this, with an ongoing strategy of digitally enabled primary and outpatient care. The project therefore was timely as it aligned with the above strategy.

1.3 Leicester city an overview

Leicester city is situated within the East Midlands in the United Kingdom and in 2021 its population was around 368,600 (Office for National Statistics 2022c). It is a multicultural city with one of the most diverse populations in England and Wales (Office for National Statistics 2022c, 2022d, 2023a). Over half of its residents are from a non-white British background (Leicester City Council 2020). It is the most densely populated area within the East Midlands (Office for National Statistics 2022c, Office for National Statistics 2023a).

In a survey three out of ten adults in Leicester stated they had an illness and disability which affected their daily living activities (Rigby and Wheeler 2018). Compared with the national average, life expectancy is low (Public Health England 2020a). Leicester's older adult population aged 65 and over has increased 16.9% between 2011 and 2021 (Office for National Statistics 2022c). Leicester city is a poor area (Ministry of Housing, Communities and Local Government 2019, Leicester City Council 2020). More than two thirds of people who live in the city live in the top 40% of nationally deprived local authority areas (Leicester City Council 2020). In the ranking of English indices of deprivation which examines deprivation across several areas including employment, income and health Leicester was found to have 29.8% of older adults living in an income deprived household. Health deprivation within the city is also high with 11% of residents living in the top 5% of national health deprived areas (Ministry of Housing, Communities and Local Government 2019). This means that people within the city face various health inequalities and people living in Leicester have shorter life expectancy than other local authority areas (Leicester City Council 2020). Addressing health inequalities is an aim of Leicester city council and an aim of its care, health and wellbeing strategy is to promote older people living at home independently (Leicester City Council 2022).

Although in England and Wales people living alone are increasing in numbers, people from black cultural backgrounds and ethnicities had the highest levels of living alone and people with Asian cultural backgrounds the least (Office for National Statistics 2022e). In Leicester 29% of people aged over 70 live in a multigenerational household and there is a high rate of people living in overcrowded houses (Office for National Statistics 2020, Swindells 2023).

1.3.1 COVID-19 and Leicester city

On the 11th of March 2020 the World Health Organisation declared the outbreak of COVID-19 as a worldwide pandemic (Sherrington 2022). In response to the pandemic on the 23rd of March 2020, the UK was placed in a national lockdown to stop the spread of the COVID-19 virus (The institute for government 2021). Research has found that people from non-white

backgrounds are at a greater risk of catching COVID-19 (Pan et al 2020). Other risks included living in a deprived area and being an older adult (UK Health Security Agency 2022). Despite the lockdown measures, Leicester continued to have high rates of infection (Public Health England 2020b), arguably due to its population demographic and local challenges. This meant as the national lockdown was eased Leicester was placed in a local lockdown and had one of the longest periods in lockdown/restrictions compared with other local authority areas (Scott 2020, Nazareth et al 2020, Rashid 2021).

1.4 Recruitment Issues

The project however had many challenges with recruiting potential participants and due to this the research was unable to be carried out as planned. Most academic discourse available focuses on recruiting older adults into clinical trials. There is a dearth of research about recruiting older adults in applied health/ social science research. This report discusses the issues faced in attempting to recruit single older adults in a study that used digital technology to promote independence in their own homes by monitoring behaviour. Following a literature review and an evaluation meeting with gatekeepers, older adults and carers, including a reflective account of some members of the project team, the report provides an in-depth understanding of the barriers and difficulties in recruiting older adults for a research project that used digital technology, and make some recommendations that could inform researchers and health and social care providers.

1.5 Further outline of this report

- **Chapter Two:** Explains the original planned project, its aim and methodology. It explains the inclusion and exclusion criteria of participants and the recruitment strategy used.
- **Chapter Three:** Explores the literature around why the recruitment for the study may have failed.
- **Chapter Four:** Explains who contributed to this evaluation report and the reasons why. It goes on to explain the methodology of how data was collected and analysed.
- **Chapter Five:** This demonstrates the findings from feedback and reflections from various people who were involved in recruiting for the research. Findings are presented thematically.
- **Chapter Six:** This discusses the data findings and recommendations for other researchers or health and social care professionals recruiting for similar studies are made.

2: THE PLANNED HOWZ (SMART METER) PROJECT

The potential of 'big data' approaches is increasingly being recognised, and the value of people's data signatures as indicators of activity, wellbeing and broader social trends is being explored in a variety of health and care settings (Fergus and Chalmers 2020; Liao et al 2014; Debes et al 2016; Chalmers et al 2019). This project is timely and aligns with the NHS long term plan (2019) strategy on: digitally-enabled primary care and integrated care systems. Several studies demonstrate that functional change in an older-adult with multi-morbidity can be the earliest warning of deterioration and action taken at this point may improve outcomes and reduce distress and intervention costs (Chalmers et al 2019, Bowling and Grundy 1997). A service development was therefore designed by the Willows Health GP practices in Leicester City UK to introduce Howz sensors as mechanisms to identify and address the care needs of older adults with long-term multi-morbidities in the community. The planned research project was due to use mixed methods to answer the main research questions which were:

- Can a smart-meter app monitoring the electricity usage of older adults detect anomalies that relate to significant health needs?
- Can a smart-meter app that monitors electricity usage help identify unmet care needs in the older population, allowing timely care interventions?
- Can a smart-meter app designed to detect how older adults interact with their domestic electrical appliances, an important parameter to assess their needs?
- Is the ability to monitor the daily living activities housebound older adults remotely and non-intrusively acceptable to them and their carers/next of kin (addressed over a multi-ethnic community)?

2.1 The HOWZ Kit and smart phone app

The research was due to use Howz technology which uses smart meters that are already present within the home or can be easily fitted and do not restrict users. Its built-in analytics can detect normal patterns of electricity usage within the home and is able to alert next of kin via the app if any changes in the routine are detected. The app developed by Intelesant is free to download and can be used with a smart-meter (as per our study) or the Howz kit. The analytics uses 30 min aggregated electricity usage from the Smart-Meter stored by Smart Data Communications Company (this is Ofgem regulated). The research plan was to apply machine learning (artificial intelligence) to model the complexity of the individual older adults' daily activities. The older adults' next of kin or carer would also download a similar app onto their smartphone, which would enable them to receive information transmitted from the smart-meter app of their older relative and monitor their relatives' routine physical activities. After the

installation of the smart-meter app, activity recognition is performed to determine the older adult daily routine. The daily routine of the participant was then due to be analysed over the next seven days. Once the older adult's daily routine at home has been established, the app continues tracking their daily physical activities on an ongoing basis. During this period, if there are significant changes to the daily electricity usage – the app transmits alerts to the app on their next of kin/carers smartphone. When a change is detected, the next of kin/carer could then make an informal check of the older adult and intervene if necessary.

2.2 Study Design and Participants

The study was due to use mixed methods when collecting and analysis data.

2.2.1 Quantitative Data:

Participant demographic data was due to be collected, such as age, ethnicity, and gender. Further information was due to be collected by the various systems. 1) the number of alerts raised by the app; 2) how often the alert has led to GP intervention will be extracted from the medical centre records; 3) variables from the participants health-seeking behaviour 6-12 months before and after the installation of the app 4) Examining health seeking behaviour of the participants in a specified time. In addition, the medical centre was due to identify 100 older adults without the app who will be approached to be part of a comparator group. This group was due to be aged and risk matched to the evaluation group.

2.2.2 Qualitative Data:

A maximum of 20 older adult participants and/or their relative/carer who uses the app from the intervention group were due to be invited to participate in semi-structured interviews. The interviews were designed to explore participants experiences of using the smart-meter app. Additionally, a maximum of ten GPs who planned to use the information from Howz app to aid their assessment of their patient were to be invited to participate in the semi-structured interviews.

2.3 Inclusion Criteria for the Evaluation Group

The older adult needed to be (1) be an electricity user; (2) use the Howz smart-meter app; and (3) live independently. A carer could be a family member or individual from the community who visits the older adult either in a formal or informal manner who has access to the Howz app in relation to the older adult but did not live at the older person's address. No other exclusion criteria were applicable. The recruitment team first began to attempt and target over

75's who had an hospital admission over the past year and due to difficulties in recruiting this particular age group the age criteria was loosened to include older adults aged 60 and above.

2.4 Ethical considerations

The ethics committee at the faculty of Health and Life Sciences at De Montfort University approved the study on 21 May 2021 (HLS FREC Ref: 3793), and permission to conduct the evaluation was obtained from the Willows Health Leicester, Director of Services and the Information Governance Officer. Ethical issues were managed in line with guidance from the British Psychological Society ([BPS] 2014; 2018) and specific guidelines on internet-mediated research (BPS, 2017). GDPR regulations as outlined in the DMU GDPR policy were followed in the recording of focus groups, transfer of data for the purposes of transcription and analysis.

2.5 Recruitment strategies

Gatekeepers are influential in the recruitment of participants (Walker and Read 2011). Researchers within health often use health professionals in the recruitment of participants which may impact on the potential participants deciding if they will take part in the study (Bucci et al 2015, Daly and Hannon 2019). There has been an increase in stakeholders being involved in research projects such as health professionals, beneficences, and private organisations over the last 10 years (Serrano-Gallardo et al 2022). Stakeholders are very important in studies because the relationships they already have with potential participants fosters confidence and cooperation between the potential participants and research project (Serrano-Gallardo, et al 2022). Within the proposed research project, the Willows Health GP practice, a provider of primary health care services in Leicester and Leicestershire identified and approached potential participants.

The recruitment process was varied. 432 number of potential participants were contacted by three members of the GP practice staff employed by the Willows Health practice. Table 2.5 below breaks down the ethnic background of potential participants approached by the Willows Health GP Practice. There was no statistics kept by the GP practice about reasons potential participants declining to take part in the study.

Table 2.5 Ethnicity Demographics of older adults approached by the Willows Health GP Practice.

Ethnicity	Number
White	377
South Asian	41

Other BAME Backgrounds	14
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There were no statistics kept by the community organisations that were involved in recruitment however the majority of community groups were supporting older adults who were South Asian. Potential participants were sent a letter containing the participation information sheet (Appendix 2) about the study and this was followed up with a telephone call to discuss participation. The telephone calls to potential participants were made at the potential participants GP surgery to ensure that they recognised the incoming telephone number calling. Flyers (Appendix one) promoting the HOWZ study were placed across the Willows Health GP surgeries. The study was further promoted at COVID Vaccination clinics and people who met the inclusion criteria was given a flyer. One recruiter took part in two health related online events with older adults and then discussed the project at the end of the event, and felt it generated some good conversations but ultimately not recruitment. The incentive for taking part was introduced at a later stage when the recruitment team started experiencing challenges - potential participants were to be offered a £20.00 high street voucher.

A systematic review found that working with community groups was a pragmatic approach in accessing participants (Bonevski et al 2014). Within this study as a method to promote recruitment, community engagement was attempted. Researchers contacted workers from local older adult community groups within the third sector. Other academics at De Montfort University were also made aware of the project. Some of the workers from the community groups attended workshops and meetings about the planned research project. The identified workers were asked to make their colleagues aware of the project, to increase the number of identifiable potential participants. If a potential participant was identified, the community group worker were due to approach them on the researcher's behalf and then introduce them to the research team if the potential participant was amenable to this. However, this recruitment approach was not successful. From the community groups that fed back on their experience very light touch to recruitment was used, most contacted their colleagues and made them aware of the project, however no potential participants were approached directly. To ensure willing and informed consent, participants were not given a specific time in which they decided if they wanted to take part in the study. This was left opened ended to ensure that potential participants had enough time to speak to next of kin, family, and carers.

2.6 Chapter Summary

This chapter explained the aim, methods and methodology of the original Howz study. It explained the inclusion and exclusion group of potential participants and explained the recruitment strategy used which ultimately failed.

The next chapter explores the literature on reasons which may have detrimentally affected recruitment onto this study.

3: Narrative Literature Review

As discussed above recruiting participants to this project was challenging. The reasons are complicated and multifaceted. A narrative literature review was carried out to explore what is known about issues recruiting older adults into research projects and challenges specific to this planned project. Literature was collected pre, during and post evaluation feedback about the challenges faced in recruiting for the HOWZ project.

To be included in the literature review pre-evaluation and analysis the literature needed to explore:

- Older adults participating in research projects.
- Older adults taking part in technological research.
- Older adults and their attitude to technology.
- Smart meters.
- Fuel poverty in the local area.

During and after data analysis the literature review was widened to include:

- Researching during the COVID-19 pandemic.
- Mistrust of research.

Hand searching such as sourcing articles referenced in other articles was carried out during the evaluation. Whilst writing the report it was identified there was a dearth of literature regarding older adults and smart meters use.

The literature identified is presented thematically.

3.1 Older adults participating in research projects

The central aim for recruiting participants is gaining access to a person who can communicate their understanding and knowledge of the area being researched (Bonisteel et al 2021). It is known that recruiting participants is often the most difficult stage of any research project (Bucci et al 2015, Far 2018). However, researchers tend to not prepare for this difficulty in their research design (Hure, Smith and Collins 2008). Often researchers only become aware of recruitment issues after spending a significant amount of time and energy on the project (Bonisteel et al 2021). There are many outcomes to difficulties recruiting, such as a loss of valuable time or the worst being a complete stop on the planned research project (McDermott et al 2021, Hure, Smith and Collins 2008, Bucci et al 2015).

Discussing the recruitment process is rarely discussed within academic literature (Brambilla et al 2021, Bonisteel et al 2021). There is not a one-size-fits all approach when recruiting (Daly and Hannon 2019). It is known that there is a variety of complexities involved for researchers when recruiting from vulnerable populations (Walker and Read 2011). Different types of participants mean there will be different types of issues faced in attempting to recruit them (Bonisteel et al 2021).

Marginalised demographics are easy to not involve in research projects (Tully et al 2021). There is a lack of older adults that participate in research projects (Weil, Mendoza and McGavin 2017). Older adults as research participants are particularly a negligible demographic within health-related research (Lee et al 2001, Herrera et al 2010, Zulman et al 2011, Thake and Lowry 2017). Older adults in research tend to be healthy and live without little support (Michelet, Lund and Sveen 2014). It is acknowledged that the age range with older adults' population is diverse from ages 60 upwards (Jacelon 2007).

There are various barriers and challenges in recruiting older adults into research and there is not a preferable method (McHenry et al 2015). Ethics committees can be wary of approving research with older adults due to the perceived vulnerabilities of this population (Serrano-Gallardo et al 2022). Arguably older adults are unreasonably excluded from taking part in research projects (Jacelon 2007). Barriers include research design issues such as a high threshold for inclusion/exclusion criteria, gatekeeping and the recruitment setting with adults aged 75 and over excluded further (Schaap et al 2020, Lau et al 2022, Mody et al 2008). Other identified barriers include factors that affect potential participants individually such as physical and mental health capacity, culture, and language barriers (Mody et al 2008, Gatz 2006, Serrano-Gallardo et al 2022). Practical reasons such as transportation to and from research sites may affect recruitment (Marcantonio et al 2008). There may also be apathy towards the planned research project by potential participants (Mody et al 2008, Haung et al 2016).

The older the adults are the less likely they are to participate in health-related research (Carter et al 1991, Williams et al 2007). Williams et al (2007) sent out a questionnaire to people who had been approached through their GP practice to take part in a health-related study and refused. Men were more likely to refuse than women. The main reasons for refusal included the patient perception of being inconvenienced by taking part in the study and not fully comprehending the research aim. Other participants indicated that they had privacy concerns due to recruiters potentially visiting their home and the potential sensitive nature of data collected.

Factors found to increase older adults' participation in research include researcher's visiting the older adults at home and having short assessment periods (Marcantonio et al 2008). Being able to build trust and having time to build a rapport with potential participants and gatekeepers was seen to be key in maximising older adults' participation (McHenry et al 2015). Involving community groups and stakeholders is another positive recruitment strategy (Weil, Mendoza and McGavin 2017, Serrano-Gallardo et al 2022). Huang et al (2016) recommends involving community groups at the start of recruitment, having frequent contact with these groups, with the offer of recompense and a clearly defined recruitment plan. Likewise involving health and social care professionals early in the study was seen as good tactic in overcoming barriers when researching with vulnerable participants (Serrona-Gallardo et al 2022). Using mixed recruitment strategies e.g., posters, flyers, advertising in the media at the beginning of the study was seen as helpful (Serrona-Gallardo et al 2022). Other recommendations include having detailed information on about the project prior to recruitment on any information sheets, to facilitate potential participants feeling fully aware of the planned project (Chatters et al 2018).

3.2 Trustworthiness in a research process

One of the largest factor for participants deciding if they will take part in research is if they trust the research and the research organisation (Smirnoff et al 2018). There is evident distrust of science within society (Braun 1999). A common theme to why there is a barrier to medical research by underrepresented groups is mistrust (Slomka et al 2008, Scharff et al 2010, Schmotzer 2012, Brawner et al 2013, Hood et al 2015, Stevens et al 2016).

There are various reasons people mistrust research. A literature review exploring why ethnic minority groups mistrusted research found several explanations of mistrust which were "*mistrust of general society*" "*mistrust of healthcare*" and "*mistrust of researchers*" (Moreno-John et al 2004). Other explanations include older adults of ethnic minorities are aware of researcher's being unethical and mistreating participants in the past and being suspicious of research activity due to this (Morena -John et al 2004, Herrera et al 2010). Mistrust was found to be higher in for people experiencing life stresses such as having caring responsibilities and financial pressures (Stevens et al 2016). Other factors include potential participants not being given enough information before the study began (Slomka et al 2008).

Potential participants were more likely to participate within research if there was a good relationship and communication between the care provider and participant (Schmotzer 2012). The greater the trust participants have in researchers lessens the degree in which they are

seen as manipulative or disingenuous (Smirnoff et al 2018). Participants wanted to be able to communicate with the researchers throughout the research process (Brawner et al 2013). People from South Asian ethnicities were more likely to participate in research studies if they felt it was altruistic to do so or would improve their own health (Hood et al 2015).

3.3 Older adults and their attitude to technology

Using technology is becoming crucial within modern life, and stereotypes suggest older adults are adverse in their technological use (Mitzner et al 2010). Technology is defined in the Collins dictionary (2023) as “*methods, systems, and devices which are the result of scientific knowledge being used for practical purposes*”. Technology used in the home is generally seen to make life easier.

Older adults are seen to be part of a cohort of the population who may be digitally excluded (NHS digital 2023). There is no clear-cut answer why people are excluded from using technology and digital services, however four identified reasons include “*access, skills, confidence and motivation*” (Department for Digital, Culture, Media and Sport and the Department for Science innovation and Technology 2017:2). Older adults in the UK for example are also less likely to have internet access at home (Ofcom 2021).

Some studies examined older adults and their mindset about technology. One study with older adults aged 65-85 found more positive attitudes than negative when they took part in a focus group to discuss their outlook of using technology in their home, work and for healthcare. Positive aspects found included “*supporting activities*” which in healthcare included being able to monitor health conditions. “*convenience*” and “*features*”. Negative aspects included “*inconvenience*” due to having to stop to use the devices. Participants were also wary of the “*security and reliability*” of using the devices (Mitzner et al 2010: 1716-1719). Another study supports that older adults view technology as having negative and positive aspects. Positive aspects included being able to access information and communicate easily. On the other hand, participants thought that technology was developing quickly which meant it was hard to keep up with. There were also concerns about the practicalities of using technology as participants aged and technologies replacing human contact. However, in contrast an earlier study using Howz technology to monitor health-related behaviour in the home found that using this type of technology was reassuring to both older adults and their carers (De Montfort University 2018). Those with a higher socioeconomic status also were more positive in their use of technology (Pirhonen et al 2020). Another study found that older adults were more likely to use technology if it was easy to deal with and understand and if they view them as preventing accidents and injury (Callari, Ciairano and Re 2012).

Ghorayeb, Comber and Gooberman-Hill (2021) explored the perception of older adults using technology in the home. Some participants had experience of using a type of smart technology in their home which monitored behaviour to identify any changes in health. Other participants had not used smart home technology at all. Both set of participants had concerns that smart technology might cause extra obligations for their carer's and next of kin and similarly to the Pirhonen et al (2020) study didn't want technology to replace human touch. A number of the cohort of participants that had used smart technology in the home had the technology installed by researchers, and the trusting relationship they had with the researcher's appeared to promote positivity in the technology.

Prior to the pandemic fraud against older adults was widespread, with the internet increasingly used to pursue this population (Age UK 2015). In the aftermath of COVID-19 there is wide mistrust of technology and devices (Daffron 2023). Technology played a greater part in society during the COVID-19 to tackle the virus spreading (Alghamdi and Alghamdi 2022). Cyber criminals exploited this during the pandemic as people used unstable technology in the home (Daffron 2023). During Covid-10 online scams in the UK were at an all-time high. This included criminals impersonating others and using technology to do so (UK Finance 2023). Scams also included "*healthcare opportunities*" (National Crime Agency 2020). The rate of scams increasing was rapid for example there was a 400% increase during March 2020 (O'Donoghue et al 2020). An Irish study found that more people were cooperating in sharing their personal data to prevent, but a large proportion mistrusted the technology introduced by the government to do so (Celeste, Montgomery and Suriyawongkul 2022). People are highly concerned about how organisations use their data (TrustArc 2015).

3.4 Fuel Poverty

The planned participants lived in the Leicester city geographical area. During the latter phase of recruitment, the UK entered what has been termed a cost-of-living crisis due to a reduction in real terms in household income due to the surge in inflation which is a key denominator in the price of goods and services (Hourston 2022, Devine et al 2023). One of the largest increases in prices UK households have faced has been in energy costs with gas and electricity prices rising rapidly throughout 2022, which has resulted in 60% of households using less fuel in attempt to save money (Office for National Statistics 2023b). The government attempted to address this issue by offering support to all households, with further support available to those on a low income (Gov.uk 2022, Department for Work and Pensions 2023). However almost half of all UK households are estimated to be in fuel poverty by January 2023 (Bradshaw and Keung 2022). Fuel poverty is defined as when a household *'is unable to heat*

(or cool) their home to an adequate temperature' which is caused by *'low income, high fuel prices, poor energy efficiency, unaffordable housing prices and poor quality private rental housing'* (End Fuel Poverty Coalition 2023). A household is in fuel poverty if 10% or more of their income is spent on fuel costs (Bradshaw and Keung 2022). The Leicester city area has three parliamentary constituencies projected to have least 37% of households in fuel poverty during 2022 (End Fuel Poverty Coalition 2022). 12% of Leicester residents are struggling to pay for food, heating and clothing (Leicester City Council 2023). Older adults who live alone are more likely to be in fuel poverty compared to living with others, along with people claiming disability benefits such as attendance allowance which is paid to older adults who have care and support needs relating to an illness or disability (Department for Business, Energy, and Industrial Strategy 2022a, 2022b).

3.5 Smart Meters

After the Energy Act (2008) was passed, smart meters began to be rolled out to households in the UK during 2011 (Hinson, Barber, and Bolton 2019). *"Smart meters are gas and electricity meters which can offer intelligent functions"* (Hinson 2019). For households there are seen to be various benefits to using a smart meter including a true figure on amount of energy used, which is therefore reflected in correct billing (Hinson 2019). However, having a smart meter in the home has proved controversial to some, with privacy and data protection concerns a big issue (Collinson 2017, Hinson 2019, Camody, Shringapure and Van de Venter 2021, Haynes 2022). There is a lack of trust between energy suppliers and their customers (Bailey and Hodgson 2018).

In a systematic review and observations of smart meter implementation programme events, people in the United Kingdom were found to be resistant in having a smart meter installed for a variety of reasons 1) technological reasons such as failures and faults. 2) individual vulnerabilities and socio-economic status, such as misinterpretations about privacy and the financial costs of running a meter, 3) opposition and doubt due to apathy, privacy, and health concerns (Sovacool et al 2017). The Department of Energy and Climate Change (2015) found that once smart meters were installed overall people's experiences were positive and they interacted with the device. At the time of writing this report there was a dearth of information regarding the uptake of older adults and smart meters.

3.6 Researching during COVID-19

COVID-19 was disproportionate in its effect on vulnerable groups, including older adults (Webber-Ritchey, Simonovich and Spurlark 2021) which has had a big effect on carrying out

research with this population (Richardson et al 2020). Researchers had to be pragmatic in dealing with the ethical challenges that incurred whilst reaching during the pandemic (Jowett 2020). One identified challenge has been keeping the population safe whilst they are participating in research (User Research Community 2021, Melis, Sala and Zaccaria 2022). The outbreak of the COVID-19 changed how people interacted with one another face to face contact was discouraged (Alhosban and Amoush 2022, Melis, Sala and Zaccaria 2022). Researchers therefore had to use alternative methods such as the phone and internet in dealing with participants to keep both researcher and participant safe (Jowett 2020, Richardson et al 2020). There is criticism that using technology to speak to people remotely during the research process means that non-verbal cues and body language is missed (Gregory, Williamson and Barnes 2020).

There is a dearth of literature about recruiting into nonclinical trials after the COVID-19 pandemic. This is possibly due to many studies that needed face to face contact stopped or paused (Jowett 2020, Milton et al 2021). However, it is recognised that there has been a decrease in people being recruited into some studies during and after the pandemic (Mitchell et al 2020, Milton et al 2021). One study found that people were reluctant to take part in observational and interventional research whilst COVID-19 cases were in the participant communities (Mirza et al 2021).

Recruiting people to take part in research due to COVID-19 has proved challenging. Traditional methods of recruitment such as posters and flyers failed as people were not out in the community to see them (Richardson et al 2020). Researchers therefore have been trying out novel ways of recruiting of participants. A literature review and meta- analysis concluded that online recruitment has been successful for some groups of patients into clinical trials (Brogger-Mikkelsen et al 2020, Darmawan et al 2020). An American study about dementia in older adults concluded that recruiting and conducting the study remotely was productive and, in an area where access to the internet was low, found using the telephone as a positive tool (Wiese et al 2021). Reassuring older adults and supporting them to use technology was a successful method when technology use was identified as a barrier to recruitment (Melis, Sala and Zaccaria 2022).

3.7 Literature Review Summary

The literature review has demonstrated that there may be several reasons of relevance that impacted on people recruiting on to the Howz project. Research has demonstrated that older adults are an underrepresented group in research due to various personal and structural barriers. Mistrust of research is common within underrepresented research groups. Older

adults are more likely to be digitally excluded, and there is conflicting literature about older adult's use of technology with positive and negative attitudes found. Older adults do not want technology to replace contact with people and there is an increasing mistrust in using technology due to the rise of technological and healthcare scams by cyber criminals seen during the COVID-19 pandemic. There is mistrust between energy suppliers and customers with controversy regarding the use of smart meters. There are high rates of fuel poverty within Leicester City.

The next chapter explains the methods and methodology used when capturing the experiences and feedback of people involved in the recruitment to aid other researchers or health and social care professionals' recruitment strategy of older adults onto a health-related technological study.

4: METHODOLOGY OF THIS EVALUATION REPORT

4.1 Chapter Aim

The aim of this chapter is to explore and evaluate the challenges experienced by the project team in recruiting older adults who lived at home independently into the above technological study. It looked at specifically the experiences and feedback of people who participated in the recruitment efforts (Including key stakeholders and gatekeeping organisations), potential participant's families and carers, along with feedback from potential older adult's support organisations that were contacted to aid recruitment to the study. As stated above the overall aim of the report was to therefore reflect and identify the specific challenges and make recommendations that could inform recruitment of older adults in technological and digital health studies. A qualitative design was deemed suitable to answer the evaluation questions which were:

- In your experience, what were the barriers to recruitment?
- What approach can be applied to recruiting older adults to participate in technological and digital health studies?
- How could carers support recruiting older adults to participate in a technological research project?

4.2 Feedback inclusion criteria

To give feedback to the report there was a specific inclusion criteria that participants on the project needed to have met at least one of the following criteria.

- To be a key stakeholder or gatekeeper involved in the project.
- To have been involved in recruitment.
- To be a family member/next of kin of a potential participant.
- To be a "source" (Community organisations/services who supported/worked with the demographics of potential participants. They were contacted to aid recruitment to the study, whilst recruitment was ongoing).

Most of the people identified as meeting the above criteria were initially contacted by email to see if they would give any feedback about the project. One next of kin was initially approached by telephone and once verbal consent was given was further contacted by email.

Table 4.2: demographic information regarding the people who contributed to feedback for this report.

Pseudonym (If applicable)	How they were involved in recruitment	Method of feedback about recruitment issues
4 key stakeholders	Research design	Workshop
Eve	Recruiter	Semi Structured interview
Fatima	Recruiter and stakeholder	Semi Structured interview
Abdul	Community organisation	Semi structured interview
Ben	Carer of potential participant	Semi structured interview
Edward	Carer of potential participant	Semi structured interview
Ezra	Community Organisation	Email

The sample included 9 participants, as presented above. The evaluation data were collected in several ways, one workshop about the challenges of recruitment with key stakeholders (n=4) involved in the study, semi-structured interviews with two individuals (n=2) who were involved with the recruitment efforts, feedback from the next of kin of potential participant (n=2) and gatekeeping representatives (n=2) of older adult support organisations this included one gatekeeper who gave their feedback via email. Eight emails were sent to gatekeepers involved in recruiting for the study. However, only two replied. Semi-structured interviews were chosen as a suitable method of data collection for the evaluation due to the flexibility of their approach (Edwards and Holland 2013, Gill et al 2008). The questions asked during the interviews were open-ended, allowing participants to elaborate on their feedback as they thought appropriate.

De Montfort University researchers facilitated the workshop and semi-structured interviews. The stakeholder workshop took place online using the MS Teams platform, which recorded audio and video components of the discussions. After gaining participants' permission to participate in the video calls, the discussion was recorded. Three participants (Eve, Fatima, Abdul) were also interviewed using the MS Teams platform, which recorded audio and video components. One participant Ben was also interviewed online. However, he requested not to be audio recorded; handwritten notes were taken instead and written up immediately after the conversation. One participant Edward was interviewed by telephone and asked not to be audio recorded. Therefore, handwritten notes were taken instead and written up as soon as the phone call had ended. One participant Ezra contributed to feedback via email. The workshop lasted approximately 60 minutes, while the semi-structured interviews were 10 – 30 minutes. The recording from the stakeholder discussions and semi-structured interviews were stored

on a password-protected computer file, and once the material was transcribed and pseudonymised, the recordings were destroyed.

4.3 Data analysis

All the data collected was analysed using thematic analysis, which is often the underpinning of any qualitative research, it can be applied across many different epistemological methods (Braun and Clarke 2006). It allows “*identifying, analysing, and reporting patterns (themes) within data. It minimally organises and describes your data set in (rich) detail*” (Braun and Clarke 2006: 6)

The data set used in analysis included the transcripts from the workshops and interview, researchers notes taken during the interview, and written feedback shared by Ezra via email.

Data was analysed the following way:

- The transcriptions were read several times to familiarise the researcher with the data and to ensure there was an understanding about what was discussed.
- Data was coded by hand, and emerging themes were noted. Subjects that were mentioned several times during data collection were classed as a theme. Braun and Clarke (2006) assert that a theme should relate to answering the research question and this is how relevant themes were identified during this project.
- Themes were initially identified on each transcription and then a table (table 4.3 below) was created after three data sets were collected. This assisted in capturing the developing themes more clearly. The table begins with a broad theme, which is narrowed down further with data extracts supporting the theme.
- The overarching theme and subsequent themes identified were then used to evaluate the barriers to recruitment in planned project.

Table 4.3: Example of emerging themes

Themes		Data Extracts
Technology and Health for older adults	Technological Barriers and Exclusion	• <i>They are sort of millennial focused” (Workshop)</i> <i>“everything's going down to the point where we just have one button on a device like you just have to press it once, twice, three times a lady to get whatever instruction you want to hold it</i>

	Older adults' perceptions of the uses of technology	<i>for five seconds. Hold it for 10 seconds. You know what I mean?" And that is incredibly difficult for older people to manage" (Workshop)</i> • <i>"But the majority of if you look at the technology in the older, frail or space, it is clunky buttony" (Workshop)</i> • <i>So, they had a smart meter, but they couldn't see how that would relate to their health. (Recruiter 1)</i> • <i>Yeah, they just couldn't get their head around [Smart meters monitoring health] I couldn't get into the conversation enough even to really explain it to them. (Recruiter 1)</i>
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Emerging themes were discussed at the weekly meetings with stakeholders in the project, this aided the credibility to the findings as the group discussions at these meetings were used to help with the final data analysis.

4.4 Chapter Summary

This chapter explained how stakeholders, recruiters and gatekeeping community support organisations who were involved in recruiting for the original Howz research project gave feedback on their experiences via workshops, semi structured interviews and email to reflect on their experiences and challenges faced during the recruitment process. The feedback was used as evaluation data and analysed thematically. Major themes of why recruitment was challenging for the project is presented within the next chapter.

5: Evaluation Feedback and Findings

The evaluation study aimed to explore the challenges with recruiting older adults who lived alone to participate in the Howz research study that aimed to monitor their use of electricity in their own homes, to identify short-term anomalies and changes in their electricity usage as this could indicate a variation in the older adult's daily living activities or care needs. Previous research has shown that older adults are often not represented in research. However, there are conflicting findings about older adults and technology use with positive and negative experiences. This section will focus on the findings from reflections with the project team, gatekeepers, and carers to better understand the challenges of recruiting to the project. The findings are presented as themes.

Participants spoke of several challenges to recruit to the planned study. Central to the discussions was the theme of older adult's perceptions on how energy use pattern from smart-meter app could be used to aid in identifying changes in their activities of daily living activities or care needs. Another identified theme was mistrust due to privacy concerns and unease that electricity usage was being monitored in the cost-of-living crisis. There was research apathy amongst some older adults and others who indicated that the study would only be suitable for older adults that were 'frail'. Researching in the aftermath of COVID-19 where technological scams were at a high was also described as a barrier to recruitment. There were also structural and practical challenges to recruiting in the Leicester City geographical area. There are four included themes which are: misperception of the research study aims and the technology to be used, mistrust of the research study (including a sub theme of friends, family and carers), research apathy, researching in the social context of Covid-19 and recruiting within Leicester City.

5.1 Theme one: Perceptions of energy use pattern and monitoring of daily living activities in older adults

An overarching theme identified was the perception of the overarching research study aims, which was to monitor the use of electricity, to identify short-term anomalies and changes in the electricity usage older adults and identify short-term anomalies and changes in their electricity usage as this could indicate a variation in their daily living activities or care needs. There was a lack of technology literacy about how smart meters could be used within a health-related study, along with a misunderstanding about the intensity of the monitoring of behaviour that would occur, which led to potential participants feeling that the study would be too intrusive within their day-to-day life.

In the stakeholder workshop participants discussed that within the UK older adults are underrepresented in health-related technology research studies which immediately hindered recruitment.

that's absolutely key something about older people not involved in clinical research. There's no culture of that (Workshop member).

Discussions with recruiters revealed that older adults who were approached about the study had difficulty comprehending how a smart meter could be used in a health-related study.

So, they had a smart meter, but they couldn't see how that would relate to their health. (Fatima recruiter).

The minute I kind of start talking about electricity or something to do with an app. It through them off a little bit. It was like why you're calling from my doctor surgery'. (Eve recruiter).

Older adults did not want to discuss the project as it was bewildering for many, due to their lack of technology literacy and overall knowledge about technological devices.

Yeah, they just couldn't get their head around [Smart meters monitoring health] I couldn't get into the conversation enough even to really explain it to them (Fatima recruiter).

The app being mentioned [to older adults] this is too technological for me like I can't deal with this (Eve recruiter).

Some of the recruiters reported that the older adults approached could not perceive how the smart-meter app technology would be used in the study “*it felt like somebody was taking care of them via an app... That app became the carer*”. Eve recalls conversations with older adults who thought that health care staff would be continually monitoring them through the app replacing the need for carers.

but what happens when you go home? who's gonna then keep an eye on me? what happens when it's weekend what happens then?

if you go on holiday for two weeks, who is taking care of me then? How do you know if I've had a fall? I'll be relying on someone to pick up that I've not used anything today.

In the workshop it was reflected that these types of studies are often “*not put in the frame of self-management -but monitoring*” and discussions revealed that the older adults, carers and members of the community organisations believed that the perceived level of monitoring was intrusive *it felt like an invasion, like an eye was being kept on them, watching*.

Abdul reinforced the notion that the app was too intrusive and concurred that there were less invasive ways of alerting someone in a health-related emergency.

if you are that vulnerable to need it, you would have a personal alarm.

Some older adults explained to Eve their fear that their independence may be obstructed if they took part in the study and viewed the technology as being a risk to continue their current lifestyle.

one day I might pop out to the shops. I might go bingo on the way home, I might go to my neighbours for a bit. I've not been home for 8 hours. Is there someone that's gonna say? Why are you not home?

if I popped to the shop and I then decide to bring a friend back with me. You've then picked up electricity usage again.

The lack of technology literacy and misperceptions about using a smart-meter app to monitor activities of daily living to aid older adults' wellbeing heightened the mistrust of some older adults, carers and gatekeepers about the study.

5.2 Theme 2: Mistrust of the research study

Another core issue identified was a high level of mistrust of research using technology that would monitor behaviour within the home due to privacy concerns, which also led to challenges in recruiting and enrolling older adults in the study. “*There was something about it I didn't trust, I couldn't explain why*”. There was concern on who had access to potential participants energy usage pattern, along with the unease that the study was gathering information about electricity usage within the home. An identified sub theme related to the beliefs and perceptions of potential participants friends, family, and carers as due to their mistrust of the project, which negatively impacted the recruitment process.

one that said it was big brotherly (Fatima recruiter)

It was definitely an evasion of privacy” (Eve recruiter)

Ben a carer explained that he felt uncomfortable having the technology in the home, as he perceived that it would be able to differentiate where he was within the home.

I was worried about privacy; I don't know about you, but I don't want anyone to realise I was in the bathroom or toilet.

One older adult explained to Eve about their fear and suspicion that the technology would be used to monitor when the house was quiet, to enable criminal activity.

You're asking about my electricity, which means you can keep an eye on when I've gone to bed. What if I get burgled in the hours that you've noticed that I've not moved?

Older adults, gatekeepers and carers questioned “Where was the data going”? Edward explained his concerns about data and who had access to it after he was approached about taking part in the study.

I don't understand what's going on...who is dealing with it? [The study data].

Eve explains that due to the difficulties of understanding that using a smart meter could be used in health-related research and that their GP practice would be recruiting for the study, some of the older adults were extremely suspicious and hostile towards her when she approached them.

I said I'm calling regarding this. They accuse me of lying and said I'm from an electricity company.

soon as you also hear someone's gonna come home to have a look at your smart meter, they don't believe it's from the NHS because... There's not anything similar to this for them.

At the time of recruiting electricity prices within the UK were at an all-time high “their own bills have gone up” Some of the older adults approached perceived that the real aim of the study was to establish their electricity consumption and how sustainable their usage was and became fixated on this.

you're trying to get my meter readings so that you can charge me the accurate price (Eve recruiter).

quite a lot of them [older adults] was more like, well, I've got solar panels (Eve recruiter).

There is also a substantial degree of mistrust of outsiders asking questions about their personal and especially financial situation and of having devices in the home which can be suspected of gathering such information (Ezra Gatekeeper).

Recruiters explained that they were unable to reassure potential participants that the study had nothing to do with the older adult's electricity bills, however due to the anxiety around the increasing cost-of- living could not successfully alleviate any concerns.

We're not here to detect your bills. Nothing will be costing you. I've tried to be reassuring of that as much as I can, and but it was OK. You wanna see how much data I'm using. (Eve).

Eve noticed that another way the increasing cost-of-living post-lockdown affected recruitment was that some participants claimed that they had cut back on their electricity usage so much so that the older adult perceived that the technology would not be able to capture the data needed for the research to work.

I'm really struggling with my bills. I turned my lights off as a day-to-day basis quite often, and I've reduced my kettle usage and stuff anyway because of our cause of how expensive things have gone.

5.2.2 Subtheme: Friends, family and Carers perceptions about the study

All the older adults approached were asked to speak to family, friends, and carers about participating in the study. However, the findings suggest that even within this social network, mistrust and fear about the aim of the study were evident within this population, exacerbating the recruitment challenges. This may have been due to the amount of information in the media about the increase of scams that had occurred since the COVID-19 pandemic. In the workshop it was noted that a carer was suspicious after receiving a telephone call about the project from his father's GP practice and called the practice back to clarify.

is it really true does this person really work at the (GP surgery name removed for anonymity)?

Recruiters noted that next of kin and /or carers heavily influenced the recruitment process. It was observed that they acted as gatekeepers and regularly blocked the recruitment process from progressing with older adults that were initially interested in taking part in the study.

The carers, muscled in and said don't' (Fatima)

a lot of them would be like, OK, I'll speak to my son and daughter and get back to you. They wouldn't. (Eve)

Eve recalled speaking with an older adult whose son who perceived that the technology used would be a replacement for the family caring for the older adult and stopped any further discussions about taking part.

We're here for you. You don't need that type of service.

Along with having recruitment challenges due carers lack of the specific technology literacy the project recruiters noted that some older adults were apathetic to taking part in any research.

5.3 Apathy and participation in a research process among older adults

There was apathy about taking part in the planned study. Some of the older adults approached were not interested in taking part. Fatima explains the reactions of some of the older adults when they were contacted about taking part in the study. The recruiters regularly were unable to engage the potential participants in any conversation to discuss the project in any depth.

No interest, it was just. No, I'm not interested.

They [Older adults] just want to get me off the phone.

Other adults did not feel as they were frail enough to take part in the study and refused to discuss the project any further as they were offended at being deemed to need monitoring in the home. Edward and Eve explained some of the reactions of older adults who were affronted about being asked to take part in the study.

I'm not a little old man.

Who said that I need the support? (Voice raised to convey outrage).

I'm a 92-year-old saying I'm fit fine, and I live on my own, he's like love. I don't need their [The research team] help. Thank you very much.

It was evident that the research project taking place in the aftermath of the COVID-19 lockdown also had a major impact on the recruitment process.

5.4 Researching in the social context of Covid-19

Potential participants gatekeepers and carers were very suspicious when recruiters attempted to contact them by telephone regarding the study. Recruiters and gatekeepers explained that technology including the telephone had a perception of being unsafe and people were cautious when contacted this way which scuppered recruitment and engaging with potential participants.

The phone is no longer a safe place (Fatima).

smart phone use was patchy and there was a widespread mistrust of Zoom fuelled in part by early stories of security breaches (Ezra gatekeeper).

Although the telephone number was not withheld that the recruiters called on. Potential participants were no longer confident that it was their GP surgery calling. Fatima explains.

Even getting an answered phone. Was challenging, you know, being able to even explain who you were on the phone really, really difficult.

This anxiety by potential participants is evidenced by Eve when she explains how they needed to verify her identity when speaking to some older adults.

they get scammed so much on the phone that I think a lot of it when I'm saying calling from the surgery, they are making me verify absolutely everything from who they last saw, which clinician, which day did I come in? What time did I come in?

The public health response to COVID-19 meant that patients had difficulties in seeing their GP's which had severely impacted the older adults trust in primary health care services, this in turn was damaging when recruiting for the study as when contacted some people mentioned *"I don't have anything to do with my practice anymore... And I can't even get an appointment, no."*

Along with national challenges due to the impact of COVID-19, Leicester city suffered the longest lockdown and also recorded some of the highest case numbers of COVID-19 in the country. As a result, this placed additional challenges for the recruitment efforts.

5.5 Recruiting within Leicester city households

The 2021 census figures from the office for national statistics, indicated that Leicester is one of the first cities in the UK to have a non-white majority. The largest ethnic group in the city now comprises people from an Asian background. Eve explained that it was common for people from Asian cultures to live with their wider families and this meant that many of the people approached for recruitment had to be excluded due to their living arrangements.

we have a lot of Asian [patients] and a lot of Asians don't tend to live on their own. They tend to have daughter in laws and grandkids and the whole lot with them. So even if they did want the support, it wouldn't work for that basis because they're not alone.

In addition, discussions with some older adults revealed that some did not know if they had a smart meter, and many did not.

Not everyone had a smart meter (Abdul gatekeeper).

I don't know if I've got a smart meter.... I don't know what a smart meter looks like. (Eve recruiter).

Other living arrangements that excluded older adults being recruited onto the study, including those living in supported living and residential care.

5.6 Chapter summary

Presented within this chapter is the evaluation themes that were identified by people who reflected on the recruitment process that was carried out for the planned Howz research project. The overarching theme identified was the *"perceptions of energy use pattern and monitoring of daily living activities in older adults"* where there was a deep misunderstanding of the purpose of the study and how the planned technology would monitor behaviour within the home. *"Mistrust of the research project"* which highlights potential participants misperceptions and deep mistrust of the planned technology to be used due to the cost-of-

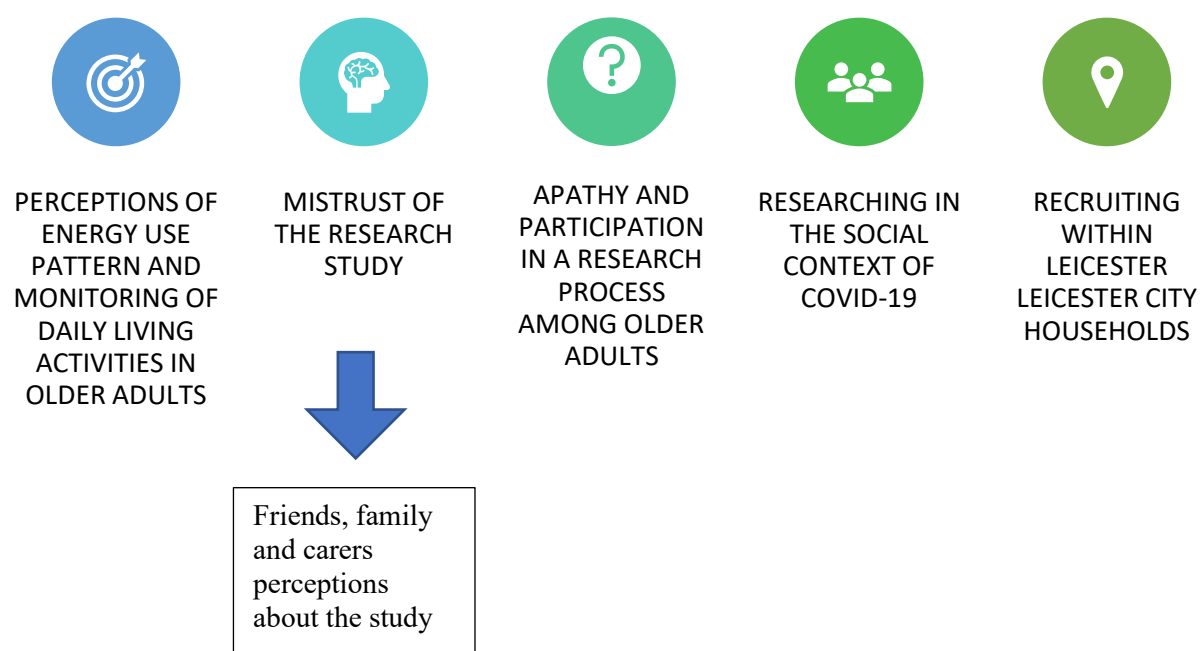
living crisis and concerns about privacy in the home. A subtheme of *“Family, friends and carers perceptions about the study”* which demonstrates how this mistrust and misperception of the research aim was evident. *“apathy and participation in a research process among older adults”* where participants did not feel necessarily frail enough to be participants in the study. *“Researching in the social context of COVID-19”* which hindered recruitment due to the increase of technological scams across the UK during this period. The final theme *“Recruiting within Leicester City Households”* highlights practical and structural issues encountered which were specific to the recruitment geographical boundary.

The next chapter explains what has been learnt and the recommendations made to researchers and health and social care professionals to assist recruitment in this type of research going forward.

6: Evaluation report reflection and conclusion

This evaluation report discusses the challenges of recruiting older adults onto the planned Howz research project and identify recommendations to assist other research projects with older adults as participants and technology in the future. After discussions and feedback from people who were involved in the recruitment of the project in various ways, five main themes and one subtheme demonstrated in figure 6 was identified to explain why recruitment ultimately failed with the planned project.

Figure 6: Identified themes and Subtheme.



There were a variety of reasons of why recruitment was not successful for this project. The reasons were multi-faceted and relational. The core theme was the potential participants and social networks perceptions of energy use pattern and monitoring of daily living activities in older adults. This was impacted further by the mistrust that the potential participants had with the technological device, the lack of technology/app literacy and their misperception of the health monitoring which created concerns about privacy and who had access to this data. The increasing cost-of- living and the research using electricity to obtain data further compounded the mistrust about the study. Recruiters were initially contacting potential participants by telephone, who were highly suspicious of being contacted this way and were perplexed that a smart meter could assist with monitoring their health. The theme of mistrust was potentially

compounded by it being well published that older adults are a target by fraudsters. The general public had also faced an increase of scams by criminals since the COVID-19 pandemic and relying on technology in the home. Other identified reasons were people not being interested in the study and not feeling frail enough to justify their activities of daily living being monitored. There were also challenges that were unique to recruiting in the Leicester city area such as older adults living in multigenerational households which meant many older adults approached did not meet the inclusion criteria.

The key limitations to the evaluation data was the response rate from people and organisations approached to take part in giving feedback and therefore only a small number of people contributed. However, the key organisations and individuals who led the recruitment participated in the discussions. Although it is also acknowledged that some of the people who did give feedback and took part in discussions about the report may have been biased in their feedback due to their involvement in attempting to recruit for the original research project, however this arguably is a strength due to having a deep understanding and awareness of the issues they faced when recruiting. In addition, carers/next of kin of potential participants also gave their feedback.

6.1 Implications

Given that a lot of medical studies target disease outcomes or physiological targets (e.g., blood pressure), it appears there is lack of appreciation older adults, family and carers that changes in behaviour and functional level potentially acts as a better sign of impending illness and may well precede the finding of any abnormal physiological measurements. Moreover, many older people who are medically 'frail' may not see themselves as that. These perceptions then immediately put the 'pitch and premise' of the study at a disadvantage. There needs to be a robust approach adopted by researchers when they are recruiting older adult research participants during a pandemic and increasing cost of living in an intervention studies using technology. This report has highlighted that older adults, their carers (if applicable), and gatekeeping organisations must be informed about the technology. Additionally, involving older adults/carers/PPI representatives in the research design and process is critical to allow any concerns and queries to be worked out. Although the study commenced when the research site (Leicester City) was in lockdown with social distance measures in place, the involvement of older adults/carers representatives could have provided researchers with some insights into the challenges of requesting potential users to participate in the study during such a unique period. In addition, researchers in the area must be aware of limited technology literacy within different population groups. Therefore, research information given to the

potential participant about the technology is fully understood to enable informed consent and aid recruitment. To prevent misconceptions and mistrust of using technology interventions in older adults' health research, researchers and developers of technology need to build relationships with older adults to encourage confidence and trust in the technology and research process, be personable to the older adult and engender communication between the research and technology team throughout the research process.

6.2 Research recommendations

The challenges that the research team experienced with the recruitment process were interlinked and multifaceted. Therefore, to facilitate the recruitment of older adults' participation in technological interventions health-related research the following recommendations are made:

- Researchers to design a mechanism to consult with representatives of older adults, carers, gatekeepers and community organisations during the research process design. This may assist in identifying barriers/challenges in advance of the recruitment process beginning, so amendments can be made quickly.
- Build within the recruitment phase a period for establishing trust and rapport with potential participants, their carers and relevant community groups to assist in easing their concerns about the technology, the research process and working with researchers and developers from outside their communities.
- To showcase the technology and allow the potential participants to interact with the device during the recruitment process to reassure and allow complete comprehension and aid technology literacy.
- Individuals initiating contact to recruit participants must have basic knowledge about the technology and the research study (so they can answer questions).
- For large health research projects using technology intervention and comprising interdisciplinary research team members, there should be a named person who is a member of the team with extensive experience in research recruitment of older adults who oversees the recruitment process, with an in-depth understanding of the technology, who will act as the named person for further information for the recruitment team.
- Where possible, recruitment should leverage the gains of strong relationships between clinicians, social care professionals and patients and may have greater success in direct face-to-face clinical contexts as opposed to mailshots and cold calling.
- With limited in-person options during the social distancing measures – the recruitment team should consider employing multiple recruitment strategies, including emails from

research centre/organisations, research project website and local radios to publicise the study and act a reference point for potential part.

- Researchers need to be aware of individuals, community and external factors that could impact participation and be adaptable and consider alternative recruitment strategies as challenges arise.
- To include the process and mechanisms for incentivising potential participants to participate in the study.

6.3 Dissemination of findings

There is no specific way to disseminate findings (Wilson et al 2010). Traditional academic methods include publishing journal articles and attending conferences, however there are other beneficial ways. This project will follow the recommendations by The National Institute for Health and Care Research (2019) who recommend the following points to be considered when disseminating findings “*Stakeholder engagement*” “*Format*” “*Utilise opportunities*” and “*Context*”.

The main audience for this research will be other researchers, health and social care professionals who will be recruiting older adults into a technological study. The research will be disseminated to this group in various ways through different channels of communication.

- Via the fourteen Academic Health and Science Network to aid learning.
- To NHS England and Integrated Care Boards to aid learning when commissioning services,
- To Primary Care Trusts and Providers to assist when rolling out digital technology and innovation.
- Via the Academic Health and Science Networks “Digital Health Accelerator Programme”
- Via forums within the primary care and secondary care services.
- Via journals and academic conferences.
- Through social media and newsletters.

6.4 Conclusion

People who contributed to this evaluation report reflected on recruitment of older adults to a health-related technological study which monitored behaviour within the home. There was misperception of the research aim and mistrust of the planned technology that would be used in participants homes. This mistrust was possibly heightened due to technological scams

increasing during the COVID-19 pandemic. Another factor identified was the cost-of-living crisis with electricity prices at an all-time high and the association of electricity costs with a smart meter. A key lesson learnt was the importance of clear communication and taking time to build trust amongst older adults, their carers and community organisation throughout the research process. It would also be beneficial for uptake in recruitment if the older adults could see and interact with the planned technology during the recruitment process to help further alleviate any concerns.

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Appendix One: Howz Flyer

Do you have a Smart Meter?
Can you help the NHS?



We want to know whether a Smart Meter can be a simple way of knowing that someone is OK

When people are active at home they use electricity

Our app can let you or someone else know if things don't look like

Our app also has videos and tips on staying active

We can also save you money on your energy bills



FIND OUT MORE

Please call us on **0161-226-5353**



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East Midlands
Academic Health
Science Network
Igniting Innovation

NHS
Surrey and Borders
NHS Foundation Trust



We are asking you to participate in an evaluation of this new service and may ask you to participate in further research with NHS or academic partners

Appendix Two: Participant Information Sheet

WHAT IS THE STUDY ABOUT?

The reason for our study is to examine a smart meter app as a mechanism to monitor older adults' electricity usage and thereby detect any anomalies that could relate to health needs.

WHY HAVE I BEEN CHOSEN?

You have been approached because you have been identified by your GP to meet the reasons for our study, but if this is not correct, please let the researcher know.

WHAT DOES PARTICIPATING INVOLVE?

Your participation would mean that you agree to be interviewed on the phone about your experiences of using the smart meter app.
The interview should not last more than 30 minutes.
The day and time for the interview will be agreed at your convenience to ensure minimal disruption to your normal routine.

WHAT ELSE WILL I HAVE TO DO?

No action will be required from you apart from giving consent to read your electricity smart meter remotely and for you to participate in the interview.

Your relative/carer will be approached for consent to use the smart meter app and to participate in the interview.

After giving you the time to experience the app, we will contact you to arrange for an interview to discuss your experiences with the smart meter app.

DO I HAVE TO TAKE PART?

It is up to you to decide whether or not to take part.

WHAT IF I AGREE TO TAKE PART AND THEN CHANGE MY MIND?

You are free to change your mind about your participation at any point in time without giving a reason.

