

Predictive Modelling and Data Linkage

Rob Shore, Ruth Porter, and Steven Senior

Data linkage in Bradford

The story so far

Connected Bradford



Connected Bradford is a secure pseudonymised cloud platform that links multiple routine datasets from public services, local gov, and voluntary organisations across Bradford



Enables researchers to explore patterns in data and understand how services intersect and interact



Aims to support targeted insights and interventions and the efficient and evidence-based allocation of resources.





Connected Bradford: linked data case study

Early years foundation stage profile scores can support in identifying children at risk of ASD

Investigating the association between early years foundation stage profile scores and subsequent diagnosis of an autism spectrum disorder: a retrospective study of linked healthcare and education data

Linking education and health data

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Abstract

Objective We set out to test whether the early years foundation stage profile (EYFSP) score derived from 17 items assessed by teachers at the end of reception school year had any association with autism spectrum disorder (ASD) diagnosis in subsequent years. This study tested the feasibility of successfully linking education and health data.

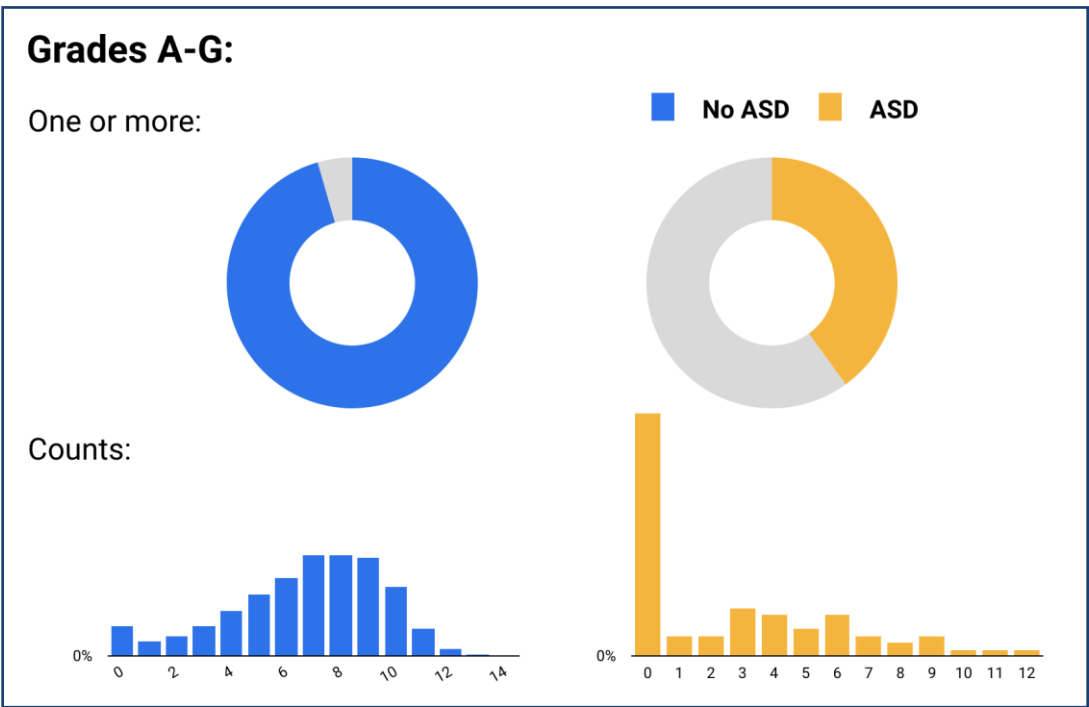
Design A retrospective data linkage study.

Setting and participants The Born in Bradford longitudinal cohort of 13, 857 children.

This could lead to earlier interventions - preventing poorer outcomes associated with undiagnosed conditions.

Connected Bradford: linked data case study

No SEND support



SEND support

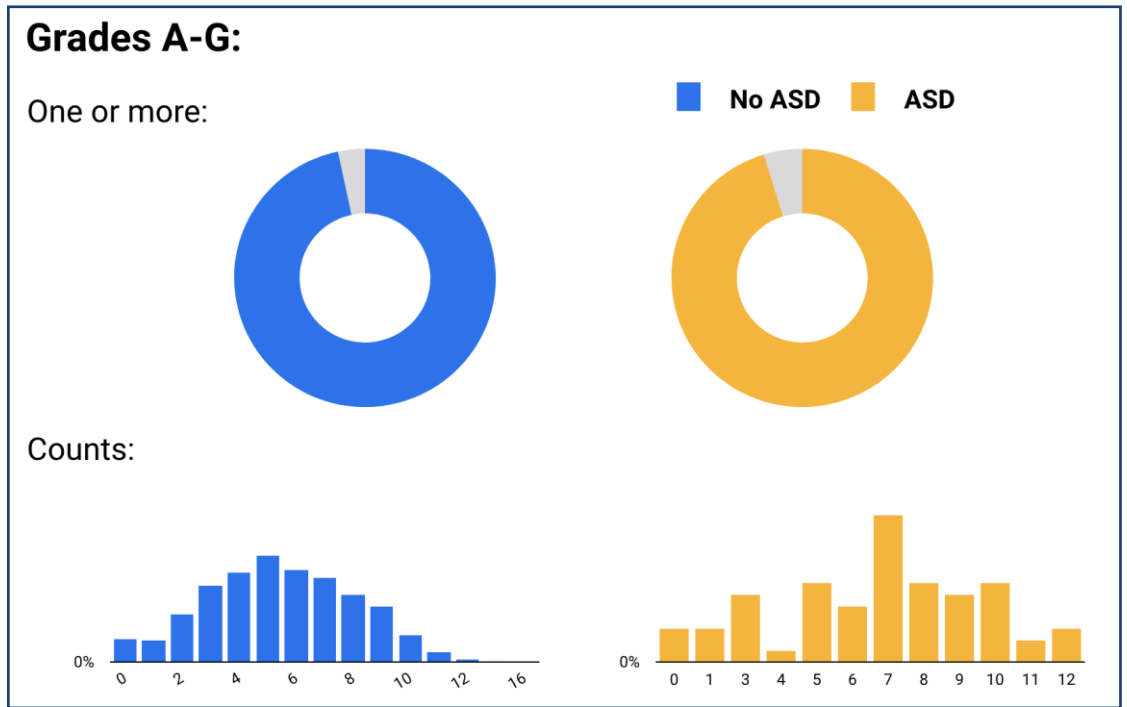


Table discussion 1: Data linkage

- What are the major opportunities around linked data sets?
- What are the main challenges, barriers, and risks to building and using linked data sets?

Predictive modelling

Predicting risk of falls using the eFalls system.

eFalls: background

eFalls is a falls prediction model which uses routinely available primary care electronic health record data via Connected Bradford to help identify people at risk of hospitalisation or emergency department attendance after a fall over the next 12 months.

The challenge:

NICE guidelines and [evidence review](#) includes an assessment of eFalls and concludes:

"Overall, there is currently not enough evidence to support the use of any of the risk prediction tools, and further evidence is needed within UK health settings to assess the applicability of risk tools in current practice".

Next steps:

- Can we apply eFalls model to a local authority ASC data?

Table discussion 2: eFalls

Task: eFalls Applied to Local Authority with ASC routine data

- How could this model integrate with existing LA systems, teams and data (e.g., care records, hospital discharge data)?

Break into groups and design a conceptual model. Address the following:

Model Type: Predictive analytics, AI/LLM, or ML? Why? What datasets are needed? Data quality and challenges.

Service Integration: How will the model inform care planning or commissioning? What digital tools or dashboards might be needed?

Application: How will frontline staff use insights? What training or cultural changes are required?

Evaluation & Validation:

- How will success be measured? (e.g., reduction in falls, improved outcomes)
- Validation methods, accuracy, bias and fairness checks.
- Ethical and governance considerations (GDPR, transparency).

A cautionary tale

The Combined Predictive Model and the Fylde Coast Extensive
Care Service

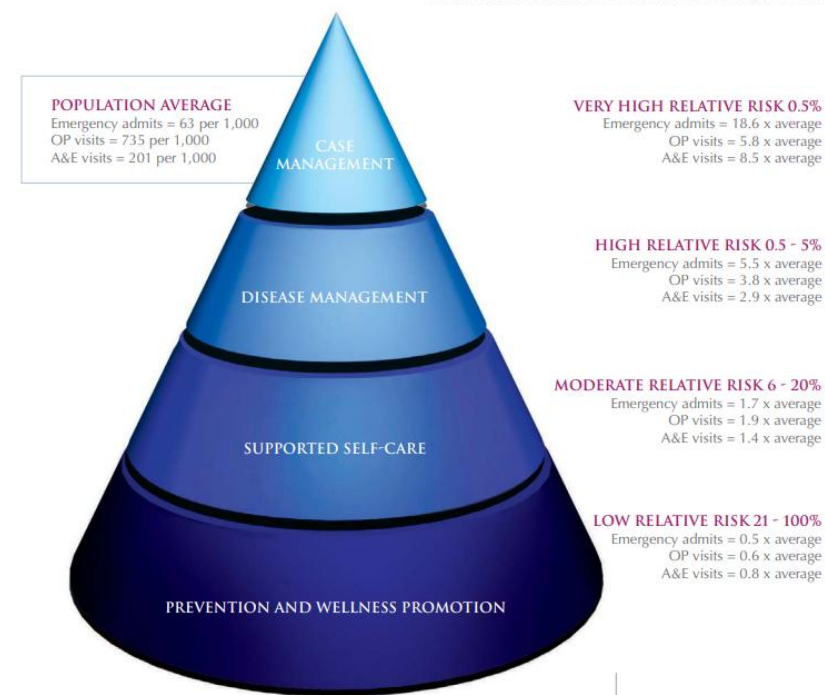
Fylde Coast Extensive Care Service

- Part of the Fylde Coast integrated care vanguard introduced in June 2015.1
- Patients identified through risk stratification:
 - Aged over 60
 - 2+ long term conditions
 - Predicted risk score of hospital admission in the next 12 months according to the Combined Predictive Model.
- Offered a consultant extensivist-led model which provides pro-active and coordinated care for 'high risk' patients replacing usual GP care.
- Multi-disciplinary care teams based in neighbourhoods responsible for managing individual care plans.

The Combined Predictive Model

- Developed in 2006 with funding from DH(SC) by a consortium including King's Fund, NYU, and Health Dialog.
- “based on a comprehensive dataset of patient information, including inpatient, outpatient, and accident & emergency data from secondary care sources as well as general practice electronic medical records.”
- Built and validated to a good standard.
- Reasonable predictive performance?

FIGURE 1
SEGMENTATION OF PATIENT POPULATION USING COMBINED MODEL

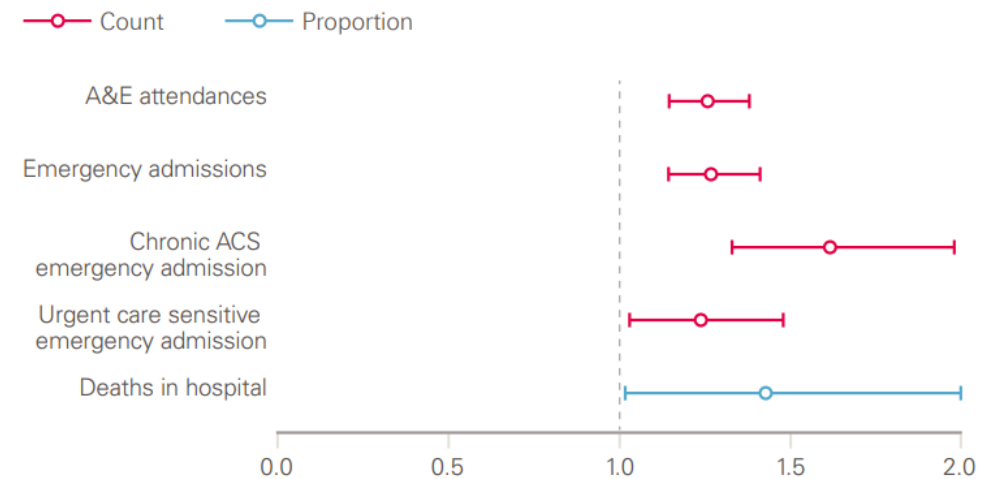


Did it work?

- Evaluation done by [Health Foundation/NHS England Improvement Analytics Unit](#).
- Compared patients referred into the service with matched controls.
- Compared with matched controls, patients offered the service had:
 - More A&E attendances
 - More emergency admissions
 - More admissions due to chronic ambulatory care sensitive conditions and urgent care sensitive conditions
 - More deaths.

Figure 4: Estimated effect on hospital use of ECS, compared to matched controls

Estimates and 95% confidence intervals shown for treatment effects are after regression adjustment for remaining differences after matching.



What might we learn?

- Evaluation methods need careful thought.
 - It is possible the comparison group were less ill in ways that couldn't be adjusted for. Suggests **randomised controlled trials may be necessary**.
 - **Duration of follow-up may be important** as [longer-term follow-ups of similar projects](#) may have found less negative results in later years
- Predicting an outcome is different from being able to change it.
 - **Need to have an intervention** which is effective, cost effective, and acceptable, and adequate resources.
- Consider potential for over-treatment and harm
 - In many 'high risk' cohorts, most would not experience the outcome of interest without intervention, but all will receive the intervention.
 - Interventions may do harm as well as good.
- **This is not an isolated finding.** A systematic review by [Oddy et al \(2024\)](#) found “little evidence to suggest that accurate identification of high-risk individuals can be reliably translated to improvements in service delivery or morbidity.”

Sources of guidance

- Much predictive modelling is like screening for disease. The [UK National Screening Committee's criteria](#) can help guide thinking around predictive modelling.
- The NHS Health Economics Unit and Midlands and Lancashire Commissioning Support Unit have produced a ['how to guide' for risk stratification](#).
- If the goal is to save money, then Strategy Unit's framework [here](#) (included in the paper above) is useful for estimating break-even values depending on how good your algorithm and intervention are.
- The Improvement Analytics Unit has some [resources to guide robust evaluation](#) that may be applicable in social care as well as health care settings.

Closing discussion

- What do we need to be able to make a success of linked data and predictive models?

The future of Social Care Case Management in an AI world

Chris Wilson

Product Director, Local Government

Angela Robertson

Case Management Product Lead, Local Government



We work with care providers across the care continuum, supporting medical professionals, care givers, support workers, parents, educators and individuals



45+

NHS Trusts using
our healthcare
solutions

10k

Registered care
providers across
home care and care
homes



200+

Local authorities
trust our Social Care,
Education and Youth
Services solutions



50k

Individuals protected
by **Technology
Enabled Care**

The widest ecosystem of interconnected solutions for Local Authorities and Health Boards



We help authorities **deliver your statutory obligations efficiently and effectively ...**

- **Achieve Objectives:** Ensure equality of access; improved outcomes; and empowerment of individuals
- **More for Less:** meet increasing demand within a constrained funding envelope; reduce administrative burden / inefficiency; drive automation

... and we enable authorities to **transform your service delivery model with AI**

Our Strategy:

Evolve an ecosystem of solutions supercharged with AI to enable Local Authorities to transform their service delivery model



The evolution of an interconnected portfolio of solutions to support the delivery of high-quality Person-centred outcomes



Closer integration of health and social care, to enable an individual's condition to be assessed and managed in a wider context



Focus on proactive insights to support prevention, through remote monitoring and assistive technologies - Technology Enabled Care (TEC)



Supercharged use of AI and data to drive improved decision making and outcomes



Unleashing the potential of a Local Authority with Access Evo

We are transforming the Access Local Government portfolio with Access Evo from fragmented products into an integrated ecosystem that enables councils to deliver preventative, outcome-focused care whilst protecting their existing technology investments.



The Challenges

1. **More for Less:** meet increasing demand within a constrained funding envelope and reduce inefficiency
2. **Ensure equality of access;** improved outcomes; and democratisation of control
3. **Closer integration of health and social care,** to enable an individual's condition to be assessed and managed in a wider context
4. **More focus on prevention,** through remote monitoring and assistive technologies - Technology Enabled Care (TEC)

Today

We have products that help Local Authorities address these challenges, yet within our current solution there remains gaps:

- Products are siloed forcing social workers to move between systems and interfaces
- Data lives in silos, meaning prevention opportunities are missed because insights cannot cross system boundaries.
- Staff still spend 40-50% of time on administrative tasks instead of citizen care

This leads to reactive crisis management instead of proactive prevention, poor outcomes for vulnerable citizens, and workforce burnout.

The Solution

Proactive Intervention through connected data



Surface patterns and risk indicators through Feeds that alert teams to prevention opportunities before they become crises, reducing emergency interventions whilst minimising the administrative burden of checking multiple systems.

Unified access and intelligence across products



Enable every council team to work with confidence by providing instant access to integrated insights through Access Evo's AI Copilot and unified platform



Access Evo Social Care: Supercharge the way you work

With over 1million active users across Access
Now in pilot across Local Government Social Care

Single Experience

- Bring all your social care software into one place
- Use one sign-on to move between all your Access products

Supercharge Existing Tools with AI

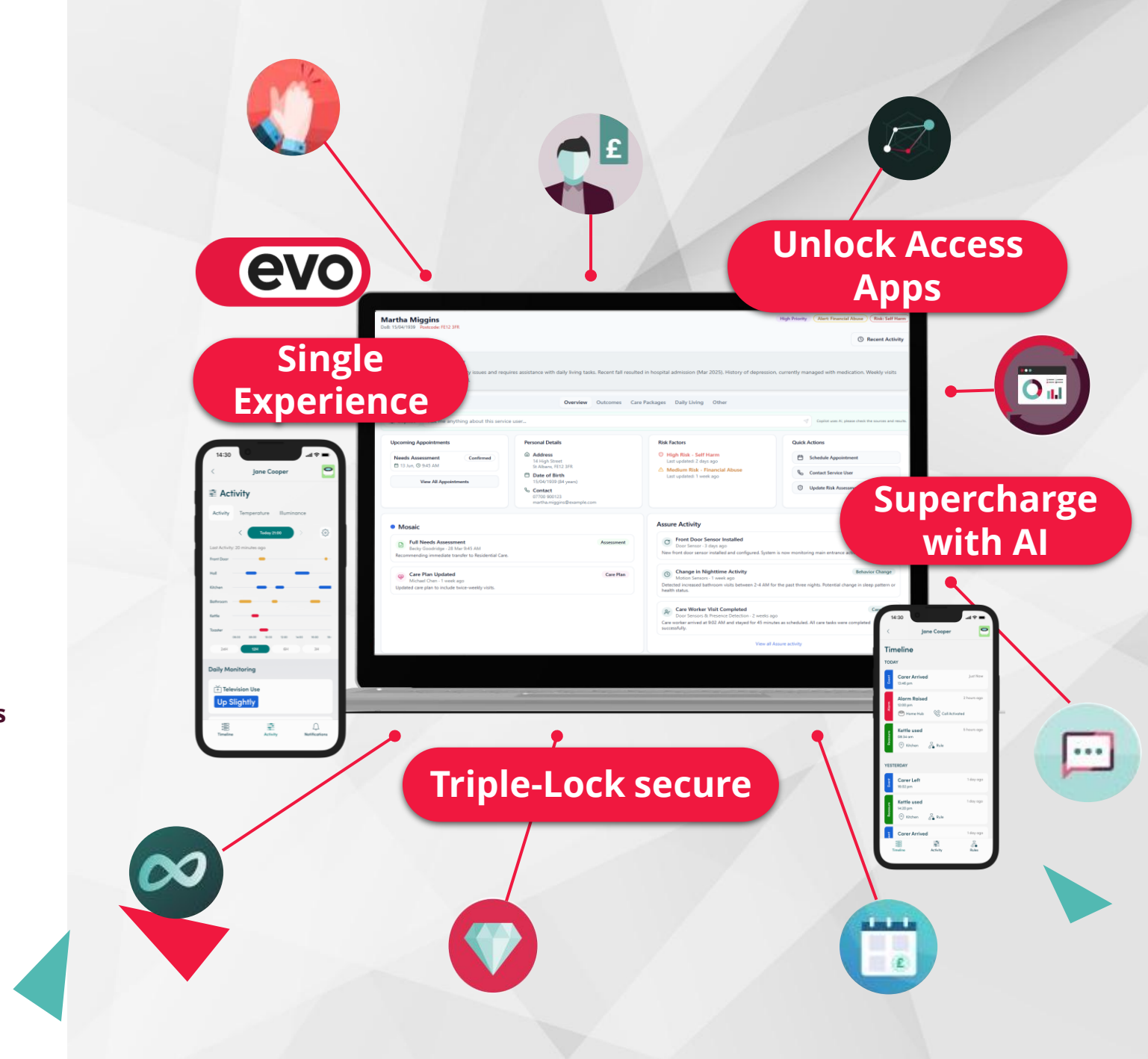
- Digital assistant to give you instant access to all your data
- Ask question to get answers quickly across your product portfolio
- Using Feed to alert you to key notification across software

Unlocks the family of Access products and integrations

- Access Evo allows you to unlock the full range of Access products and services
- Giving you new solutions to enhance the way you work for both citizens and employees
- Integrates products, allowing you to connect Mosaic and Access Assure, with further integrations coming.

Triple-Lock secure

- Company secure to keep all your data in a private environment
- Permissions aligned and maintained
- All AI use is exclusively confidential to you



The flexible, unifying, social care platform designed for Local Authorities

access Social Care ^{evo}

Case management

Configurable case management system to drive social care best practice



Case management



Referrals



Public portal



Daily living

Financial management

Streamlined billing and income collection tools



E-invoicing



Provider Portal



Finance Manager



Invoice discounting

Commissioning

Suite of tools to help drive best combination of value and quality from commissioning



Brokerage



Care Monitoring



Provider management



TEC

Insights

Rich reporting and insights available in (mostly) real time



Reporting suite



Dashboards



Embedded analytics



AI generated reports

Productivity

Support your teams to do more



AI tools



Note taking



Messaging



Policy guidance

Employee experience

Reward, retain & support your employees with ease



Communications



Reward & Recognition

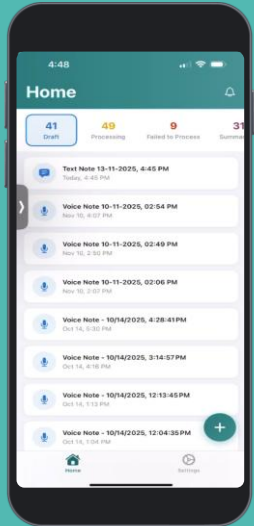


Employee Benefits



Wellbeing

How can AI be used to save time for front line workers?



We know that social workers spend upwards of 60% of their time doing admin

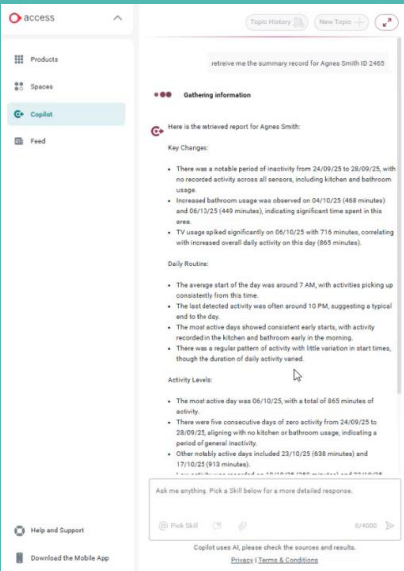
Writing notes, retrieving information, planning visits and paperwork are an overhead that we can reduce with AI

- TAG has developed Access NotesCentre as an integrated dictation tool that automatically populates forms, letters (and other templates) based on recordings of conversations
- What if
 - Social workers were given their own AI assistant
 - Checking quality of work vs best practice
 - Making suggestions (even recommendations)
 - Setting reminders
 - Reviewing work versus previous case records
 - Carrying out check-in calls via AI chat bots

How can AI be used to better inform our teams?

If our teams are stretched thin, how can AI be used to better inform them when they don't have sufficient time to understand everything that is going on?

- TAG has developed smart care summaries, we can take activity of daily living data from sensors in the home and use AI to create insights for social workers to better understand how their clients are progressing. Allowing earlier intervention and more accurate care planning.
- What if
 - Social workers had all of the available information around a client in one place
 - AI was used to summarise (linked) health/other data to supplement records
 - AI summarised and identified actionable insights
 - Social worker interventions could be proactive and more regular
 - Teams had access to all available resources (available services, equipment, policies etc.)
 - AI was used to predict/model the impact of interventions to inform decision making



An insight into the inner workings of Access and the potential of AI...

- Customer raises a query via a Support Ticket
- AI reviews the ticket and allocates it to the correct team/employee
- Employee reviews the recommendation
- If a bug/technical issue:
 - Employee tells AI to triage
 - AI reviews the bug against the software codebase and identifies potential issue(s)
 - AI reviews technical documentation (AI generated) for the relevant product and makes recommendation of fix required
 - AI adds the suggested resolution(s) to employee (software engineer) to review proposed approach
 - If agreed, employee approves and AI fixes out of hours on development environment
 - AI also runs tests against the amended code base (functionality, security performance) overnight
 - AI sends employee summary of change(s) and test results
 - If ok, employee approves as resolved and pushes to a release
- Internal debate at Access at what productivity increase is achievable with today's technology, but it is likely between 5x and 10x.

We could imagine a future where your teams don't need to interact directly with 'case management systems'.

What can I help with?

+ Ask anything



People want tools that give them what they need, when they need it. And technology is already smart enough to deliver that.

The conversation approaching us as a sector – how much of social work should be systemised?

Talking point 1

What areas should AI be used, versus any areas vs those it should never touch?

Talking point 2

If your teams saved 40/60/80% of their time, what should they do with that time?
What could the impact be?

Talking point 3

What is stopping faster adoption of technology and AI within your authority?

Improving Care with Technology

Naomi Barnard, North Lincolnshire Council

Andrew Spiers, Social Ability and the Happiness Programme

**North
Lincolnshire
Council**

www.northlincs.gov.uk

Improving Care for People – Utilising Technology

North Lincolnshire Council's Care Sector Development Team operate to help improve the quality and innovation of care provision available to residents across the county.

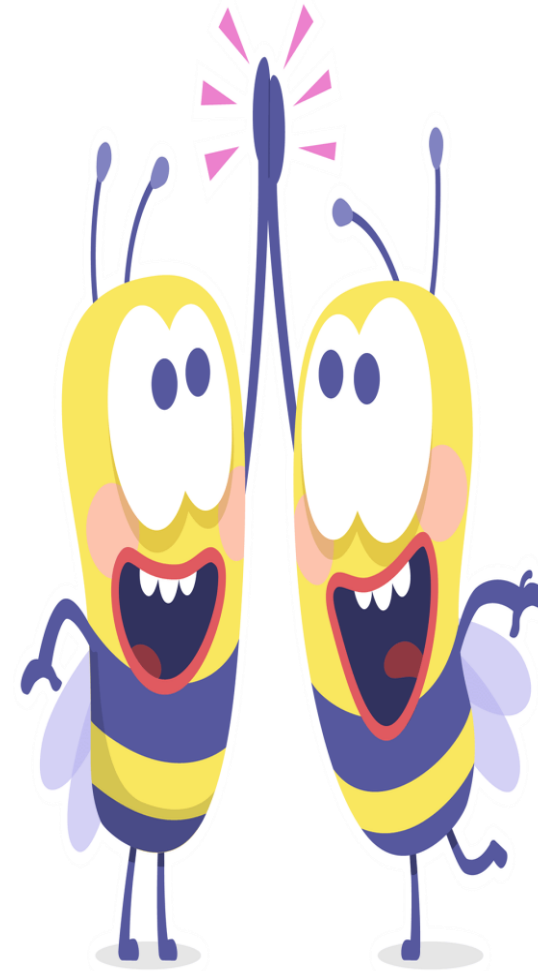
As part of this, we work in partnership with our sector to offer access to pilot projects incorporating the use of new digital technologies.

We first partnered with Social Ability in November 2024 to offer 10 Happiness Programme devices out to the sector on a two-year pilot scheme, funded via the Better Care Funds.



Our Offer to help Improve Care Delivery with the Happiness Programme

- The offer was made to the whole of our Care Home sector and 9 homes were quickly selected on the basis of an informal submission to the Team confirming why they would like to take part in the pilot, and a commitment from them to engage with regular contract monitoring via feedback.
- Always wanting to try something new, we decided to take a chance and ask one of our care at home providers if they would like to trial one of the devices. At this point in time, Social Ability had not yet had the opportunity to work with a Local Authority who had proposed use of the device in the community. I will move on to show you how this has worked, shortly!
- The Pilot project began to be rolled out at the end of 2024, and we have since expanded the scheme twice, with a total of 33 devices now on loan to our care sector, covering both standard older age provision, and our complex/working age adult cohorts. Additionally, the Team have a waiting list of Care Homes who want to take part in the project – to put this into perspective, we have 58 Care Homes across North Lincolnshire, and we currently have 32 of them engaged in the Happiness Programme pilot scheme.



The Happiness Programme

sparkling laughter and happiness

- The Happiness Programme is an innovative initiative designed to enhance the well-being and social interaction of individuals with cognitive challenges, particularly in care settings.
- The Happiness Programme is a pioneering initiative developed by Social-Ability that utilises interactive light technology to create engaging activities for individuals living with cognitive challenges, such as dementia. The program aims to foster happiness and social interaction through a variety of games and activities that are tailored to the needs of participants.
- Interactive Technology: The programme employs an interactive projector that displays games and activities on surfaces like tables and floors. Participants can engage with these activities by moving their hands or feet through the projected light, which activates different games.
- Variety of Activities: With over 80 games available, the programme includes activities such as popping bubbles, playing musical instruments, and engaging in arts and crafts. These activities are designed to be enjoyable and accessible for individuals with varying levels of cognitive and physical abilities.

Shall we give it a whirl?

- **Training and Support:** The Happiness Programme not only provides technology but also offers comprehensive training and support for care staff. This ensures that staff can effectively implement the programme and tailor activities to meet the specific needs of their residents.
- **Impact and Outcomes:** The programme has shown significant positive outcomes in care settings. According to surveys, 98% of care services reported improvements in social and physical well-being, while 89% noted enhancements in cognitive well-being. Additionally, many care services observed reductions in falls and improvements in nutrition and hydration due to increased activity levels among participants.
- **Partnerships:** The Happiness Programme is being rolled out in collaboration with organizations like the Alzheimer's Society and Sport England, aiming to revolutionize care for individuals living with dementia. This partnership underscores the commitment to evidence-based practices and the importance of keeping individuals active and engaged.

In summary, the Happiness Programme is a transformative initiative that combines technology, engaging activities, and staff training to improve the quality of life for individuals with cognitive challenges, fostering a happier and more interactive environment in care settings.

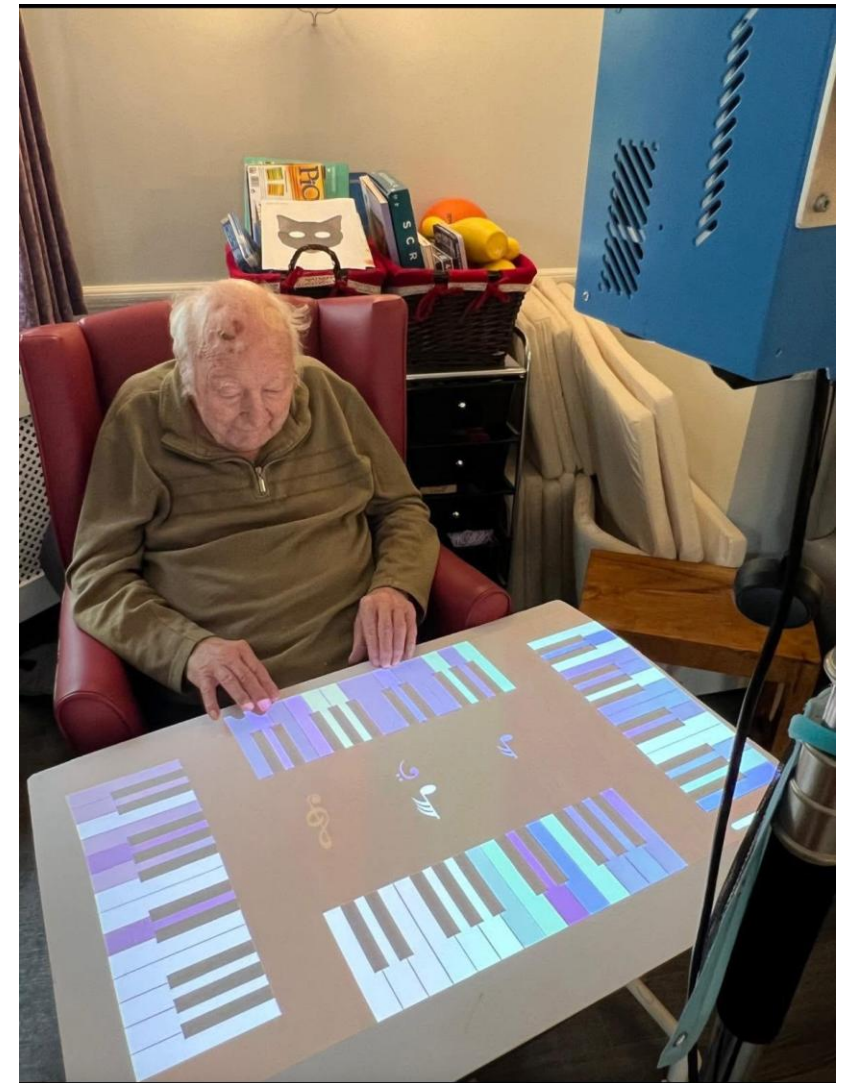
[Social-Ability - The Happiness Programme](#)

Outcomes of the Happiness Programme

Outcomes - Social-Ability

[North Lincolnshire Council and the Happiness Programme. #1 on Vimeo](#)

[North Lincolnshire Council #2 Testimonials Happiness Programme on Vimeo](#)



Outcomes from Provider Feedback

100% improvement in social wellbeing

Great social tool, encourages conversations and lots of laughter, that usually continues once the session is over.

The residents love the bingo and the quiz games, it brings people together and has improved relationships between residents who don't always mix due to different tastes, and the staff and family get to join in and have fun.

We have found that it helps with distraction, especially in times of personal care where the resident can become very distressed. We find that moving fish, fireworks and the birds settle the resident and allows her to feel calmed when being supported

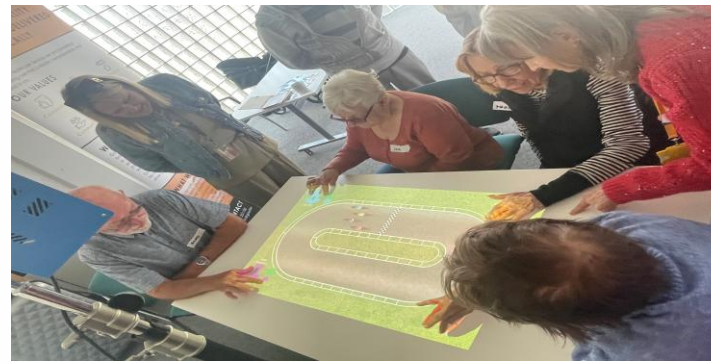
We absolutely love the happiness programme, it brings so much joy and inclusivity, is easy to move around the Home, making it accessible to all

This device has the potential to enhance the lives of bedbound residents who are frail, infirm, have sight and hearing issues, memory issues, dexterity, mobility and end of life.

Some of the games are great in terms of rehab - can and does improve dexterity and at times, speech. Fab tool.

It has proven useful as a distraction technique when heightened behaviours are starting - we have seen a reduction in the use of PRN as a direct result

The Happiness Programme Care at Home



Goodwin Healthcare are the **first care at home** provider, **nationally**, to have been asked to trial the use of the Happiness Programme in the community. It is something which the Provider, Social Ability, have wanted to explore, but have not yet been able to achieve. With the support of the Care Sector Development Team, we agreed to give it a go and see how it went!



We are so **proud** to be able to confirm that our business manager has seen great success in taking the **Happiness Programme 'on tour'** to people's homes, community events, dementia café's and more. We are currently in the process of extending our support to a Neuro Café, further broadening the reach and impact of this inclusive initiative.



The impact which we have seen from the use of the device within our community, has been amazing. Being able to bring joy, fun, and happiness to so many people we care for goes to show how the focus we put into promoting **equality of access** to technology, has paid off.

AUTONOME

AutonoMe uses the power of mobile technology to enable neurodiverse people and those with learning disabilities to gain employment and develop skills for independent living. They have created a model of support which is deliverable and enables people receiving support to achieve their outcomes. A Development Coordinator (industry expert) leads the service, alongside a library of instructional videos accessed through the AutonoMe app to support the learner to progress towards their outcomes and tailor support to their needs. Development Coordinators also provide training to support staff and employers to make sure everyone involved is working together in support of the learner

[AutonoMe - Unlocking independence | AutonoMe - Unlocking independence](#)

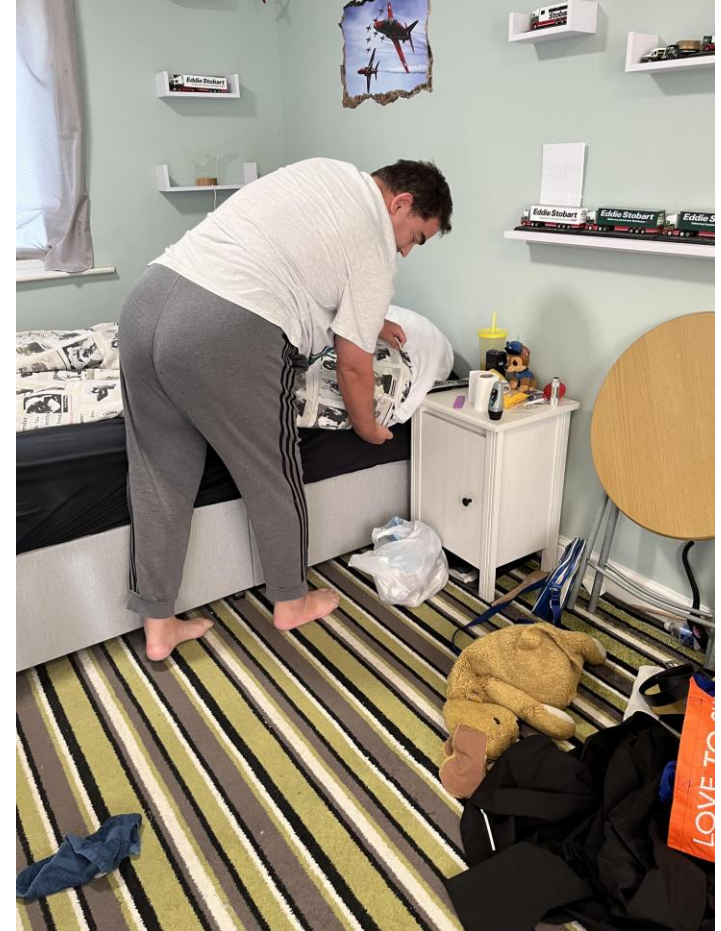
Eddie G, Hebden Court

Outset:

- Eddie started using AutonoMe at the end of July 2023.
- Eddie did not have a cleaning routine and staff would often have to speak to Eddie about the mess in his home.
- From the start, Eddie enjoyed our cooking sessions and soon started a bit of friendly competition with the other AutonoMe learners in his Supported Living complex.
- When we first started working with AutonoMe, Eddie would not use the oven as he was too anxious. I was putting everything in the oven and taking it out for him.

Actions:

- We made a chore chart for Eddie for what days he would complete allocated cleaning tasks. After a few weeks Eddie said he found the chore chart quite overwhelming as there was a lot on it, so we split the chore chart to each room. This worked much better for Eddie as he could look at one room at a time and not the whole weeks chores.
- We started alternating our focus on appointments. One week we would cook something and the next week we would concentrate on a cleaning task.
- We set up reminders for Eddie to watch AutonoMe learning, videos and complete tasks between our appointments.
- During our appointments we talked a lot about why it was important for Eddie to learn the skills that would enable him to be more independent.



Outcomes:

- Since starting to use Autonomie Eddie has watched instructional videos which cover 61 unique skills. Eddie has self-assessed progression and has completed 34 of these unique skills and is continuing to work towards the others.
- Eddie now uses the oven independently, though he still likes someone to be with him to supervise. He actively remembers different cookery methods and has the ingredients ready and waiting for me when I arrive.
- Eddie supported me with a new video for the Autonomie app. I wrote the script, and we tested it together. Eddie's input was fantastic, he prompted me on what wording he found difficult to understand and what we could say instead and helped me put the final script together.
- Eddie recently expressed that he wanted to volunteer in a charity shop. I turned on access to the Autonomie 'Employment' videos for Eddie. I supported him to complete the forms for a local charity shop and suggested videos such as 'checklist before leaving for work', and 'Asking for help in the workplace'.
- Eddie secured a volunteering opportunity and has been working in a local charity shop for a month now. Eddie is actively seeking out and watching Autonomie videos that support him around the work environment, such as giving change to a customer. I have supported Eddie with an easy read to use the till that he keeps behind the counter.

