

Act Early: Holme Wood



**The
Alan Turing
Institute**

Introduction

On 10 January 2020, 124 people came together to talk about Holme Wood — a single locality in the Bradford District. The attendees comprised front-line practitioners from community organisations, public service providers, local elected members and policy makers, alongside some of the world’s leading data scientists via invitation from The Alan Turing Institute, the UK’s national centre for Artificial Intelligence and Data Science. The purpose of the meeting was to address two simple questions:

“Can data science improve our collective understanding of a place like Holme Wood?”

“Can we use data to help the community strengthen and grow by ‘acting together’?”

In short, there was a positive answer (‘yes!’) to both questions. Our attendees’ observations and questions generated five action research projects, which we will be taking forward together. Crucially, the lines of enquiry for each project cut across traditional public service boundaries, reflecting the lived experience of people living and working in Holme Wood. **Annex A** provides more detail on the process followed on the day.

The five projects are:

- + Exclusions, children not in school, and crime*
- + Healthy choices: healthy lives¹*
- + The impact of poor mental health on individuals, the community and services²*
- + Pride, aspirations, role models and careers*
- + Adverse Childhood Experiences*

All projects will include an economic line of enquiry, considering the costs of current services and of issues playing out unaddressed — the costs to individuals, the community and services, plus the ‘opportunity cost’ — the potential positive financial effect of improving the situation and the cost of inaction.

Annex B provides more detail on each project and the initial lines of enquiry proposed by our groups.

Annex C outlines the initial ideas and questions discussed on the day by data scientists, on analytics, AI techniques and the visualisation of information.

How we will work?

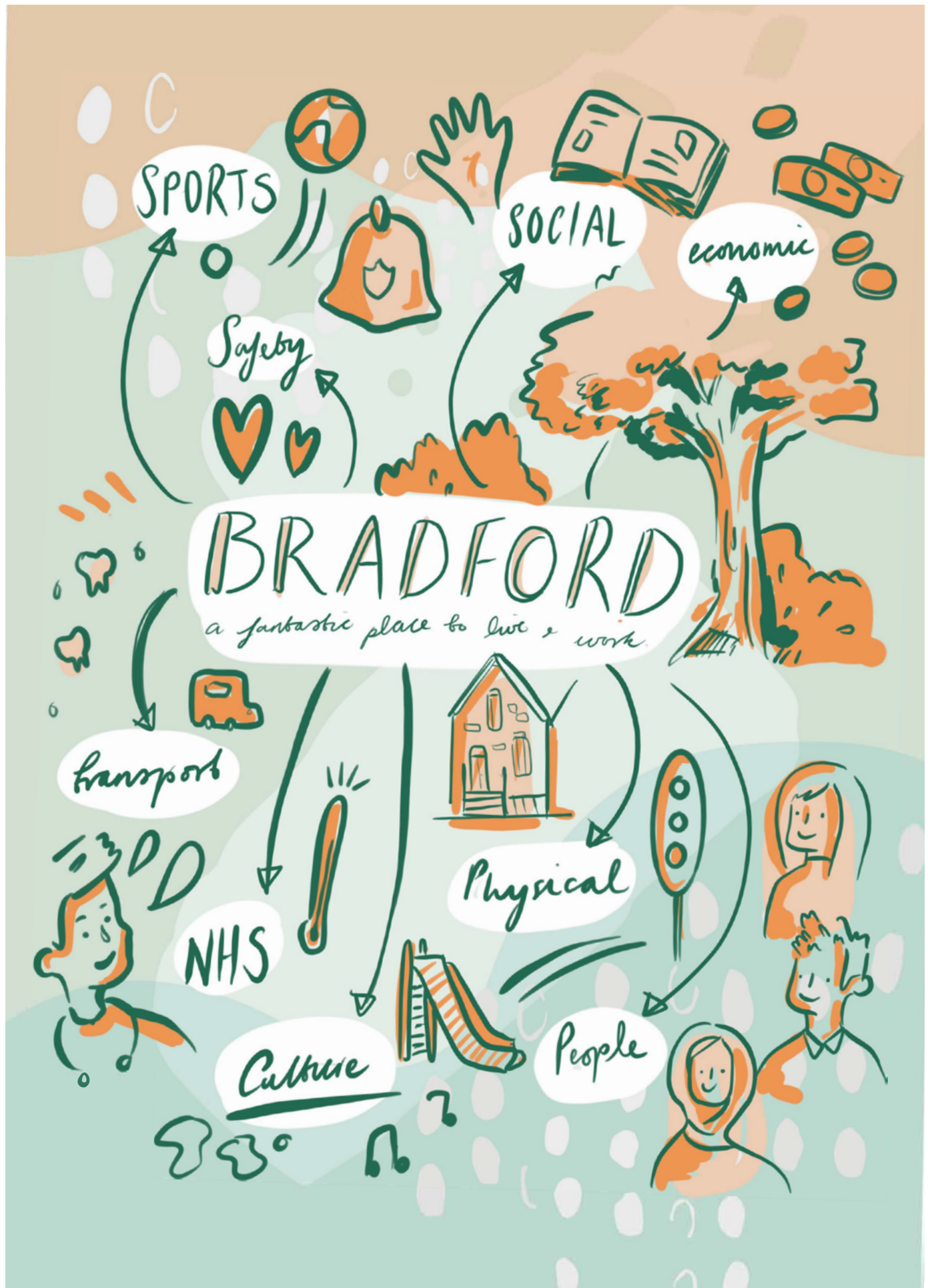
Our principles for delivery

Holme Wood has been a focus for concern, action and investment for many years. Numerous projects, including large scale investments, appear to have failed to achieve



¹ Includes dental care – impact, access, choices and food (including food impact, access and choices)

² Includes questions raised on the impact of mental health on other public services, and the topic of mental health and isolation



their goals. A common complaint is of ‘top down’ interventions, where residents and local organisations are the recipients of support, advice of investment, against goals and targets set by others, and often proved to be unattainable. **We are committed to making *Act Early: Holme Wood* different.**

First, our projects will be open to, and shaped by, the people who live and work in Holme Wood. As this report confirms, our first phase of activity will see us reach out to the community, testing the issues identified by practitioners and others against residents’ perceptions and experiences of what matters, what works, and what needs to change. This will take place alongside a similar testing of the issues by our data scientists. We will be ready to adapt our action research projects to take account of what both of these important groups tell us. As the projects progress, our data scientists with expertise in visualisation will produce accessible models that can be manipulated and challenged as easily by residents as by practitioners, policy makers and the scientists themselves. Projects will encourage participation by residents, taking part and supported to act as citizen scientists. Projects will be governed by groups including members of the community.

Second, we will be realistic about what these projects can achieve for Holme Wood. Act Early is about applying science to improve public health outcomes (including education, health and economic wellbeing). Act Early funding is available to drive the science. It cannot be used to pay for additional front line services.

But, this does not mean we lack ambition.
Act Early: Holme Wood has two important goals:

- For Holme Wood, it will propose to Bradford’s decision makers and service planners, ways to more effectively align and target services, with a focus on early intervention. It will suggest ways to empower communities to make informed choices, take more ownership of issues, and improve access to services. Local decision makers are already represented on our Act Early: Holme Wood ‘leadership group’, and have committed to participate fully in the action research projects, and to take seriously recommendations for change.

- For Bradford, and beyond, this project will test, model and share a process that brings cutting edge data science into the conversation about public services and public policy, to improve outcomes for all. Our vision is of a process (a “place-based approach” to working) that can be replicated across Bradford, adopted by other communities, and help those involved in policy making at national level, design programmes that can adapt to local circumstances. We further anticipate that Act Early: Holme Wood will allow the scientific community to sharpen its techniques and data science tools.

Why Bradford?

The desire to apply data science to public service design is not unique to Bradford or Act Early. But, Bradford is uniquely placed to host these project because it has the following resources:

- The Born in Bradford project, one of the world’s largest longitudinal birth cohort studies tracking the lives of 13,818 children (trailblazing data linkage via Connected Bradford³)
- Regional expertise in the Digital Triangle (comprising AI, Data Analytics and Immersive Visualisation Technologies)
- Diverse demographics (ensuring ethnic and socioeconomic diversity)
- A national spotlight on Bradford (Bradford is benefiting from additional support through its Opportunity Area (Department for Education) and Integration Area (Ministry for Housing, Communities and Local Government))
- Support from all key decision makers and the community

Bradford also has a proud history of using science to improve public health and education. In 1907, Green Lane Primary School began offering free school meals to its pupils. This was more than an innovation in health, social and economic policy. It also represented an innovation in and commitment to applying data science to improve children’s outcomes, because the school also

³ Connected Bradford builds on the data linkage undertaken by Born in Bradford and connects all of the routinely held data on children’s health and education across the Bradford district (going back 10 years in time)

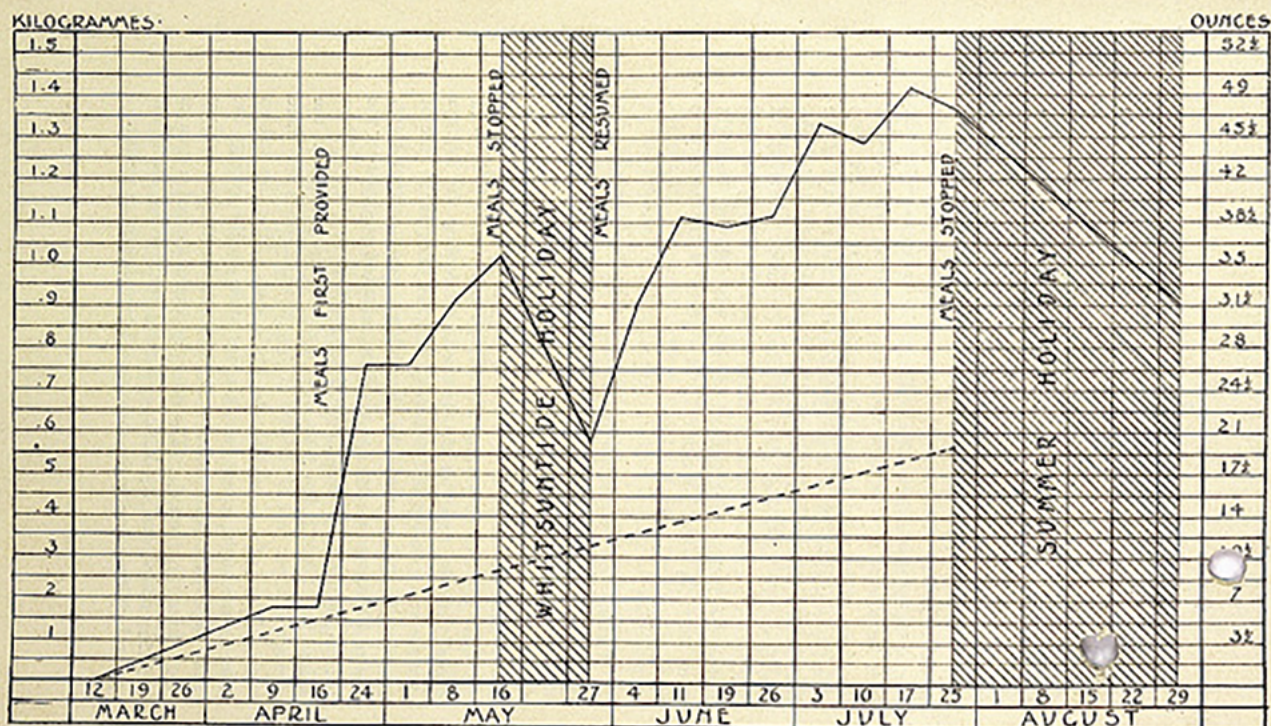


CHART ILLUSTRATING THE AVERAGE GAIN OR LOSS IN WEIGHT-DURING THE INTERVALS SHOWN-OF THE CHILDREN WHO WERE FED. THE BROKEN LINE SHEWS THE AVERAGE INCREASE IN WEIGHT-DURING THE SAME TIME- OF THE CONTROL CHILDREN.

1907

recorded changes in their pupils weight, from the introduction of the free meals. The data showed children gaining weight when the school was open and losing weight when it was closed; education and health interacting. Ultimately, the Green Lane study helped to inform national policy on school meals.

Our plan for delivery.

Each of the projects will follow a similar path:

Phase 1:

- We will ask data scientists from the Turing Institute, the Leeds Institute of Data Analytics (e.g. the University of Bradford), and the Regional Universities to link to one or more of

the action research projects, establishing online networking sites for each project, allowing for exchange of ideas and information.

- We will provide the relevant anonymised local and national data sets⁴ to the scientists, asking them identify patterns and relationships relevant to the identified issues, including predictive indicators. This will include testing the validity of perceived predictive, causal and remedial factors suggested by front line practitioners, alongside interactive data visualisation tools to communicate these relationships.
- Publicly held datasets will be tested against datasets generated by the community to identify if disparities exist between the official and

community data (e.g. through surveying the community we can explore whether community responses indicate underreporting).

- We will use this phase of enquiry to produce models that allow scientists, practitioners and residents to visualise and manipulate the models and test different predictions.
- We will widen our conversation with front line staff, service planners and national policy makers; at the same time engaging directly with Holme Wood residents and community organisations.
- This process will help each project to develop a richer understanding of the issues and the lived experiences of residents (and those supporting them), as well as develop

⁴ We have been working with local partners to secure the relevant data sets, since autumn 2019, including ensuring robust data protection measures

Promoting the action research projects; inviting people to join one or more groups

Data scientists and researchers

People living and working in Holme Wood

Practitioners working in Holme Wood

Service planners and policy makers

Action Research Project Group

Data Science Activity

Community and Wider Consultation

Within each action research group, data scientists take forward analysis and development of models; in parallel, community and other partners discuss lines of enquiry; data scientists additionally improve the quality, depth and breadth of data through local collection; and development of citizen science.

Linking and analysing datasets that follow and refine the initial lines of enquiry under each identified Action Research Project

Training in 'citizen science' available to residents, including work with schools

Testing and refining lines of enquiry, with 'residents', practitioners and service planners/policy makers — including, where possible, national and regional policy makers

Development of models and creating visualisations that ensure accessibility and usability

New 'community generated datasets' created to fill gaps and provide context

Groups come back together to undertake further actions

Action Research Project Group

Sharing, testing and refining models and visualisation tools

Using models to refine lines of enquiry

Developing proposals for action (changes to frontline practice etc.) as well as evaluation methodology, communications, governance etc.

Working in new ways, together, as proposed by the Action Research Groups



new ideas to test or resolve identified issues. It will also allow us to build the team around each project.

- We will work through established networks and partner organisations — such as Bradford's Stronger Communities partnership — to reach staff and run events in the community.
- We will launch an offer of practical training for residents, including work with students in schools, focusing on science and digital literacy. This will link to our broader Act Early and Born in Bradford goal of promoting citizen science, and strengthening the plans around making Bradford 'the City of Research' (a trailblazing site for scientific working across communities).

behaviour), and establishing: (i) clear project timelines; (ii) robust regular monitoring, feedback and evaluation processes that allow for rapid iteration.

- Learning from the process followed to this point, we will work with local partners to identify at least one and potentially two more 'places' in Bradford, where we can start to apply a similar methodology.

Phase 3:

In phase three, our projects will be delivered through to completion. End dates will vary from project to project.

Phase 4:

The fourth and final phase will conclude the research stage of the project — delivering an evaluation report containing recommendations for change to local decision makers — a new local plan — signed off by the community, data scientists and staff.

We will also deliver a process review of the methodology, with its own recommendations for improving and replicating the approach. We expect this to result in an academic publication that provides a novel contribution to the scientific literature on how to implement place-based working through data analytics.

Phase 2:

- We will bring the scientists, policy makers, practitioners and residents back together, in the 5 action research groupings. This will allow each group to share and explore the findings from the data analyses and local conversations.
- These meetings will also test the usefulness of different visualisation techniques in helping people engage with and manipulate the data.
- Each group will define and set up their action research project, setting a hypothesis for what will change in front line practice (or other areas of service planning, monitoring, targeting, or individual



Annex A: Summary of the process we followed on 10 January

Attendees were split into six 'specialist' groups:

- Two groups of front line staff working in Holme Wood, including schools, police, housing, education, community organisations etc.
- A group of senior officers and planners responsible for the design of local services (from here onwards described as the 'Planners group')
- A group of data scientists specialising in Artificial Intelligence techniques (e.g. Machine Learning)
- A group of data scientists specialising in 'Visualisation' of data (including immersive technologies and associated interfaces that allow intuitive interaction with datasets)
- A group of data scientists specialising in Urban Analytics and data modelling

In Session 1:

We asked the 'Holme Wood' and the 'Planners' group to identify the priorities for Holme Wood within the specialist groups detailed above. The data scientists shared — in their individual groups — ideas for using data science to better understand places and their social issues.

In Session 2:

We created six multi-disciplinary groups, each including specialists from all three data science groups, the planning group, and representatives from the Holme Wood 'front line' group. Data scientists and planners

were asked to respond to the priorities brought through from Session 1 by the front line group. Session 2 asked participants to develop a first sketch of action research projects matching both the front line groups' priorities and appearing likely to support robust data analytics.

Over lunch, the organising team collated the sketches produced by each of the six multi-disciplinary teams, producing a common list of eight projects based on the most common themes to be taken forward for discussion in Session 3. Other project ideas were recorded for future action.

In Session 3:

Every delegate returned to their specialist group. Each group was asked to comment on some of the proposed projects, and develop ideas for moving the eight projects into delivery. The data scientists were asked to focus on methodology. The policy group and front line groups considered how local services could support projects and how the conversation could be broadened to engage the community. In practice, the time available meant most groups focused on two or three projects in detail.

In Session 4:

The multi-disciplinary groups (formed in the second session), sought to refine the action research proposals: defining the lines of enquiry that could direct data scientists, practitioner consultations, and discussions with the community.

Annex B: Detail on the projects and proposed lines of enquiry



Project 1: Exclusions, children not in school, and crime

Context — known and perceived issues

In Bradford, 10.5% of state-funded Secondary School students (4034 students) were excluded for part of the school year, with almost 5.9% of students being excluded multiple times in the same year⁵. Persistent disruptive behaviour, and verbal or physical abuse towards other students or adults accounted for most of these exclusions. Excluded children have been shown to have poorer outcomes including mental health and social exclusion.

Within the Holme Wood workshop, concerns were raised regarding the outcomes for these children, as well as the link between exclusions and later involvement in crime (both as victims and perpetrators). There is some evidence from other longitudinal studies to link exclusions and later criminal convictions, but whether there is a causal relationship is unclear and could be tested here. There is evidence from the scientific literature that key factors associated with exclusion include male gender, ethnicity, lower socio-economic status, parental factors, mental health and behavioural difficulties, social communication difficulties, language difficulties, antisocial activities, bullying/being bullied, low attainment, and special educational needs.

Lines of enquiry: defining the issue in Holme Wood

- What are the characteristics of children excluded from school in Holme Wood?
- What does the literature identify as the predictive indicators for children likely to cause concern to the police?
- What are the characteristics of Holme Wood children causing concern to the police?
- Does crime follow exclusion or the other way around — what affects the sequencing?
- What are the preliminary behaviours for exclusions, dropping out of school, and for criminal behaviour (attendance, anti-social behaviour etc.)?
- What are the schools serving Holme Wood's policies on exclusion, are they consistent across the area; are their rates of and reasons for exclusion consistent with similar schools elsewhere (similar in cohort and policy)?
- What concerns do children cause to the police in Holme Wood? In particular:
 - Which offences?
 - Who else is involved?
 - Do we know anything about unreported crime?
- What are the interactions between Holme Wood schools and the police? (the group noted every primary school has a police presence, although criminal activity may be more prevalent in secondary). Our practitioners and policy makers

asked specifically to examine the relationship between exclusions and crime.

- The teams also reported a need to examine the influence of the following factors on school exclusions:
 - Poor school attendance
 - Bullying
 - Children vulnerable because of issues at primary-secondary transition
 - Prior speech and language issues (and whether these needs have been met)
 - Unsupported emotional and mental health issues
 - A lack of confidence in academic ability — potentially linked to a point in time such as mock exam results
 - Poor prior attainment (any stage)
 - Contact with gangs
 - Parental behaviour, in particular law breaking
 - Access to Early Help
 - Access to social workers
 - Access to out of school and holiday activities

Lines of enquiry: the economic case for action in Holme Wood

- Can we identify the full costs of implementing the current system, support and action by schools, including referrals to PRU and Alternative Provision (AP) and delivery of police services, the impact of crime

⁵ Department for Education (2019) 'Permanent and fixed period exclusions in England: 2017 to 2018'

on the community, as well as the opportunity costs for the children themselves — i.e. hours lost to learning, impact on attainment and future earnings?

- Can we predict scope for savings in Holme Wood, and extrapolate beyond this area (district, national)?

Suggested data sources

- Attendance data, exclusions data, managed moves and unexplained pupil exits
- Police arrests and incident reports
- Home schooled children
- Children missing from education

Potential responses

- What does the literature suggest are the protective and preventative factors against exclusion, and how many of these are routinely, effectively adopted in Holme Wood?
- What does the literature suggest are the protective and preventative factors against criminal activity, and how many of these are routinely, effectively delivered in Holme Wood?
- Who already works with children most at risk of exclusion and/or crime, in Holme Wood? What effect can we see on exclusions and crime (or identified predictive/preventative factors)?

Possible implementation challenges and opportunities

- There may well be a lack of data on the most vulnerable children — those excluded but not yet formally engaged by the police
- There is a risk that the number of children, once divided into cohorts (for characteristics, type of criminal activity, reasons for exclusions etc) could be too small to support machine learning techniques
- A need to be careful about the language of ‘crime’
- An opportunity to evaluate, learn from, work with:
 - The Valley Project
 - PRUs and other non-standard school settings

- Access to social workers
- Letters from family members in prison

Project 2: Healthy choices, healthy lives

Context — known and perceived issues

Life expectancy is 9.1 years lower for men and 7.8 years lower for women in the most deprived areas of Bradford when compared to the least deprived areas. In Year 5, 24.3% (1,705) of children are classified as obese, worse than the average for England. The areas where Bradford is worse than National average figures includes: the rate for alcohol-specific hospital admissions among those under 18 years; smoking during pregnancy; the rate for alcohol-related harm hospital admissions; the rate for self-harm hospital admissions; levels of smoking prevalence in adults; physical activity levels in adults; rates of violent crime (hospital admissions for violence); mortality rates from cardiovascular diseases and cancer.

Concerns were raised by the community at the workshop regarding the lack of access to affordable, healthy food. There appear to be a huge number of takeaways and convenience stores on the doorstep, with supermarkets and healthier options only available out-of-area. The consequences of poor food choices such as poor teeth and obesity were also highlighted.

Lines of enquiry: defining the issue in Holme Wood

- What do the data show regarding healthy/unhealthy food availability across the area?
 - Can we overlay obesity rates on takeaway density? Number of outlets per capita?
 - Can we map use of take-aways, including delivery services (Just-Eat etc)?
 - Proximity of takeaways to patterns of obesity?
 - Map dental issues against food availability
 - Map dental service access for the area

- Can we overlay green spaces and leisure/sports?
- Can we overlay travel patterns and modes?
- Can we track people's lifestyle and diet — what are people cooking and buying in Holme Wood?
- What are children and adults in Holme Wood being taught about healthy nutrition and cooking?
- What are the schools offering on school food choices, packed lunch policy, and on pupils accessing take away food? What role does a (healthy) breakfast club play?
- What impact does poor nutrition have on school attendance?
- What data are available from food banks about access by families, and the food 'choices' families make?
- What could supermarkets and other providers share on purchasing choices?
- Can we see a relationship in Holme Wood between poor food choices and adult literacy?
- Can we identify a location(s) for comparison outside Holme Wood?
- What is the council's policy on planning etc. for takeaways and supermarkets — is this comparable to other areas in and beyond Bradford, and is the effect of planning policy comparable?



Lines of enquiry: the economic case for action

- Costs of poor health to individuals and services, including: impact in the classroom for young people; consequence for the workplace or accessing work because of ill health; subsequent pressures on the health service
- Can we estimate the financial pressures on families' food and cooking budgets as well as time constraints and any other resource barriers – access to kitchen equipment? Include price of cooking against takeaways and ready meals
- What role could supermarkets play in shaping and offering support and better choices?
- Would adapting transport options help with changing behaviour?
- Can we model the effect of introducing new shops?

Suggested data sources

- Public health data
- Typical consumption data in Holme Wood
- The price difference between fast food and home cooked food
- The locations and quantity of fast food outlets
- The locations and quantity of 'good food' outlets
- Take away/delivery data
- School absence data, particularly where this is directly caused by nutritional issues, such as poor dental health (and dental appointments data)

Potential responses

- What does the literature suggest are the factors affecting:
 - People's food choices?
 - People's willingness and ability to travel to buy better food?
- How does this compare to what we know about Holme Wood residents?
- What does the literature suggest are the most effective approaches to educating individuals and

changing behaviour, and how many of these are routinely and effectively adopted in Holme Wood?

- What organisations and facilities are in place to deliver such approaches?
- Who already works with the families who we want to support (on any project)?

Potential implementation challenges and opportunities

- An opportunity to evaluate, learn from, work with:
 - Manchester City's 'City Cooks' programme
 - Rose Dunlop from 'Living Well'
 - A local project [ODI — Scores on the Doors] creating open source database from hygiene certificates for a number of fast food outlets, and comparison to other communities — running to 2021
 - Food banks (St Christopher's, St Columbus's, Salvation Army, TFD-library)
 - HENRY — healthy families group programmes in Better Start Bradford areas (www.henry.org.uk/betterstartbradford/findaprogramme)
 - The JU:MP project and its evaluation (www.activebradford.com)

Project 3: The impact of poor mental health

Context — known and perceived issues

Bradford District has a higher prevalence of children's mental health issues than the average for England. Bradford has more hospital admissions as a result of self-harm; a higher prevalence of children with conduct disorders; a higher prevalence of children with emotional problems; a higher percentage of primary and secondary school children identified with an SEN where the primary need is social, emotional and mental health. In summary, children within Bradford are, on average,



at increased risk for mental health disorders than other children in England.

At the workshop, the community felt:

- There was low funding and not enough resource allocated for the police to support mental health (much of their resource went to dealing with 999 calls from people in crisis)
- There was a serious need for more resources and better allocation of systems to support mental health problems
- Within the area, there was little counselling available and the fact that CAHMS is located out of the area was a significant barrier to accessing services
- Loneliness, social isolation and resilience were key factors. If people are socially isolated, they call the police because they have no idea who to turn to
- Consistent long-term solutions are needed
- The focus should be on early intervention rather than crisis management

Lines of enquiry: defining the issue in Holme Wood

- Can we map out the services and provisions currently available to be used as a resource for police etc. who can direct people (and for the community to use)?
 - Could we present this visually (e.g. social spaces)?
 - Show which services are free and which cost money to attend
 - Use map to identify what services or assets are missing in the area
 - Speak to people about what they would want
- Can we map where people suffering from mental ill health come into contact with A&E, police, CAHMS etc. to understand need in the area?
- Key groups to focus on:
 - Young men
 - Single and new mothers

- Children and young people
- Isolation is a key issue:
 - What leads to isolation?
 - Link to income?
 - Impact on children?
 - Link to lack of services/facilities?
 - What interventions would work to reduce isolation?
- New building in Holme Wood — considering putting professionals in but would lose community space. Can we simulate what the effect would be? Would need right data and would require a lot of extra data collection. Use of community centre for services relating to isolation? Or spread out services?

Lines of enquiry: the economic case for action

- Could the data scientists help with making tools available to help with evaluation of interventions implemented in the community with a focus on cost (of services)? This would help identify where additional funding or policy change is required
- Focus on early prevention is key, but need to demonstrate interventions are cost effective — is there a way of modelling this to assist policy makers/funders?

Suggested data sources

- Clinical referrals
- Police call-out data
- A&E visits for self-harm
- Social space/asset data
- Health data (physical and mental)

Potential responses

- Map out the services and provisions currently available in Holme Wood and estimate demand
- Look at the evidence as to what works in reducing social isolation, and which services are missing

- Model the effect of introducing a new/enhanced service focusing on early prevention — what would be the impact for the individual and for different services?
- Potential contacts/partners:
 - Holme Wood walking group (NHS sponsored)
 - Primary care networks
 - GPs
 - Holme Wood library
 - St Christopher's good neighbour (www.goodneighbour.co.uk/about)

Potential implementation challenges and opportunities

- The scale is so big, it can seem overwhelming
 - Issues are everywhere
 - Issues seem too big to fix
 - There are too many families with 'needs'
 - We don't even know all of the families needing help (only a subset of people in need are known to services)
 - There is a data gap with social isolation
 - Mental health is linked to deprivation and poverty, which is a symptom of lots of other problems
- Difficulties with modelling (e.g. if free up time for police by reducing callouts, then have more time in other service provision) — need to show far reaching consequences
- These are sensitive issues — need to distinguish between situations where computer modelling is appropriate and others where need to use human judgement



Project 4: Pride, aspirations, role models and careers

Context — known and perceived issues

People are ‘stuck’ — people can’t make the positive decision to live in Holme Wood (they are either there because they are given a council house, can’t get out or don’t know they can get out — it’s a negative choice or no choice) — successful people tend to leave (but with many notable exceptions).

This theme is very important to the police — they perceive that a lack of, or negative, role models/aspirations makes children vulnerable and leads to bad choices (more easily influenced and likely to get involved in crime).

- For example, children say they want to become a drug dealer (have money, fancy car) when asked in school about future job plans
- A lot of people work hard but stay quiet and are unseen as they don’t engage much with the community (unlike the clearly present drug dealer in their fancy car)
- Lots of the positive role models end up leaving Holme Wood whereas the negative ones stay

Acceptance and lack of hope are a big issue:

- Hard to change if people don’t care (e.g. rubbish in garden). The attitude is ‘we are currently coping, we think we are fine — we don’t want to change’
- People may not even know that there is a choice (the problems are so embedded, and people are not empowered)
- There is a mind-set that says: ‘what could I possibly do — it’s too big/hard a problem for me, I have little/no control over this — it’s always the same, this will just fail again’

Seeing (meaningful) change is absolutely crucial as there is a feeling that there have been no lasting changes in the past.

There is a lack (or lack of awareness) of good quality jobs and stable employment, especially within the area.

Lines of enquiry: defining the issue in Holme Wood

Tailoring the curriculum to match children needs and aspirations and ensure visible positive role models.

What is the link between education and employment? Trying to understand why students drop out is important. Addressing the re-inclusion of excluded people (expelled students don’t go back to school). Examine the relationship with parenting and the social circle (social context matters).

What affects the ability to make good life decisions and can we model this?

- Adverse Childhood Experience (ACE)
- Parenting style
- Poverty
- Lack of aspiration
- Income management (debt, smoking expenditure)
- Stress
- Social management
- Lack of choice
- Influencers of young people
- Making decisions at a young age

Lines of enquiry: the economic case for action

Could the data scientists make tools available to help with evaluation of interventions [already being] delivered in the community, which aim to raise aspirations?

Suggested data sources

- Crime data
- Food bank data
- Data from credit scores, loans, rent, bills etc.
- Buying habits, supermarket purchase data
- The basic necessary income
- The link between finances and vulnerability
- School exclusion data

Potential responses

What interventions have previously been successful in raising aspirations of young people?

Can we model the key life decisions and what we can impact?

Potential implementation challenges and opportunities

- Needs sensitivity to the fact that many people are happy with their lives
- Anything focussed on schools (e.g. developing a curriculum that supports children's aspirations) would need a huge amount of parental engagement — if parents are not involved in the process it is a wasted effort
- Lack of difficult to capture data — many people don't interact with services
- Specific data with a high level of detail are needed



Existing positive schemes

- Walk to work scheme — positive results in the past

Project 5: Adverse Childhood Experiences

Context — known and perceived issues

ACEs (e.g. domestic violence, abuse, mental health of parents) all have impact on the health and outcomes for a child.

Parents pass trauma on to children indirectly as well as directly (e.g. genetics).

These problems don't get solved — services are dealing with symptoms not the underlying cause:

- Intergenerational gaps, transgenerational issues (linked to other issues such as education)
- Bad experience of parents has impact on their children (including biological and physiological factors)

Lines of enquiry: defining the issue in Holme Wood

How/when do you intervene? Need evidence for what works, need holistic view including health, education, crime, housing, social care, benefits, social networks/ influences (who is part of the children's social network?), there should be data within public health and police etc.

Keep in mind there are different mini-communities in Holme Wood with different values, priorities etc.

Link across generations (impact of parents' variables on childrens'), link ACEs and aspirations.

Lines of enquiry: the economic case for action

Can we demonstrate the resource and financial implications of providing/not providing intervention on other services — how do parents/carers and children with ACEs interact with and navigate different services?

Suggested data sources

It would be useful to obtain rich longitudinal data to look at journey/pathway — link as many existing data sets as possible, all linked to a given person (need data sharing agreements)

May need qualitative data to supplement — why did these things happen?

Potential responses

- Link ACEs to health, education, transport, finances and crime
- Model the link between intergenerational ACE experiences (i.e. how ACEs in parents affect lives of children).
- Create visualisations of ACE data for specific communities

Examine the evidence — which early targeted intervention can prevent negative ACE outcomes (and are the best use of resources)? Can we

use natural experiments (differences detected between groups that do well and those that don't)

Potential implementation challenges

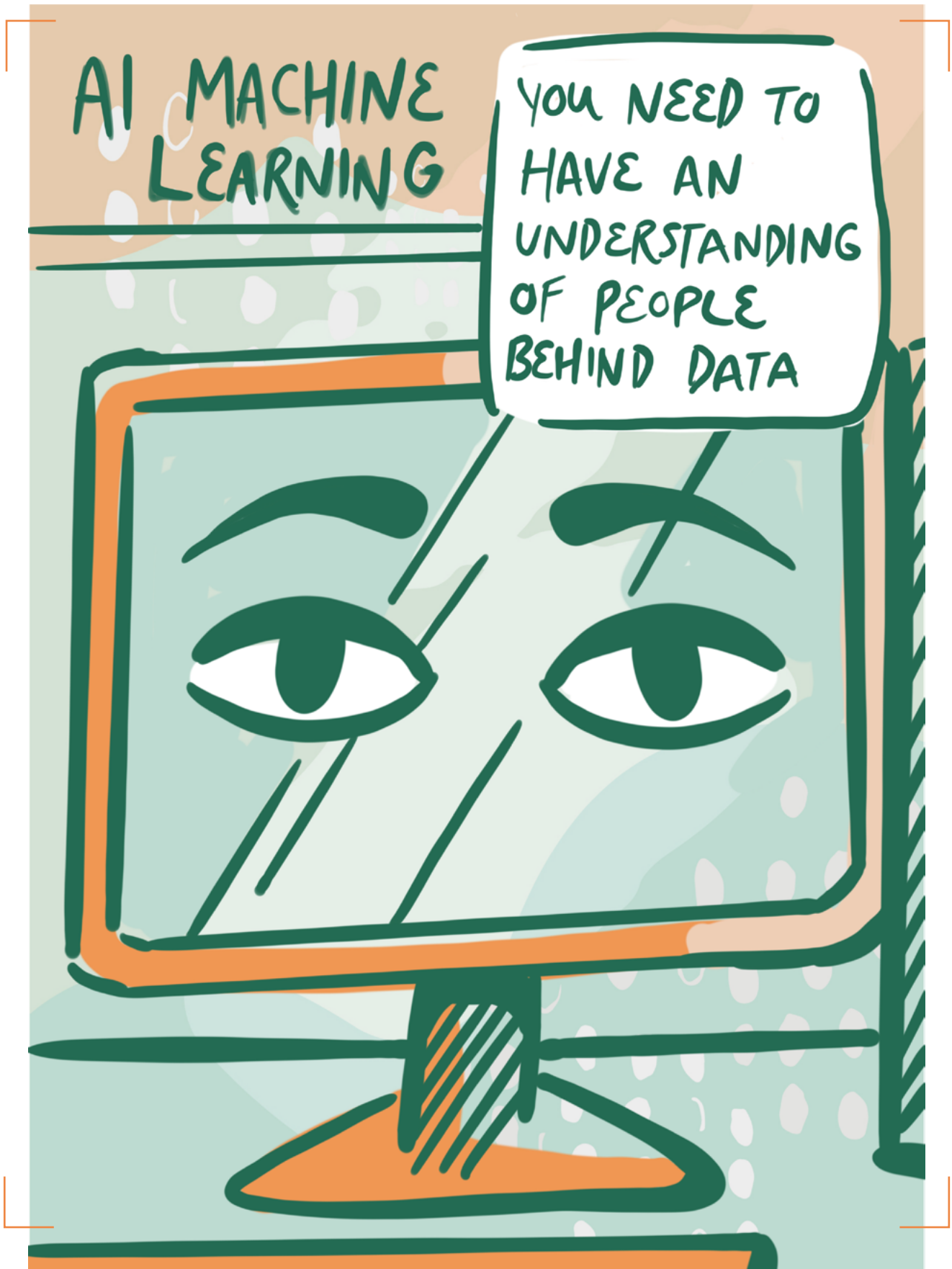
How can we identify ACEs from routinely collected data? This may require collecting a substantial amount of additional data. It is possible that schools could identify many of the ACEs for children in their schools but the collection of such data are likely to be much trickier to obtain from parents/carers and via self-report methods.

DATA SHOWS HOW
CHILDREN ARE FOLLOWING
THEIR PARENT'S
FOOTSTEPS



INTERVENTION NEEDED

Annex C – Data scientists



The Digital Triangle:

The three 'apexes' of the digital triangle comprise: data analytics, artificial intelligence and immersive technologies. Each reflects a transformative technology in its own right, but the most revolutionary applications of data science for positive societal impact will ultimately involve a combination of these technologies. Thus, the triangle provides a powerful framework for analyzing the challenges and opportunities that are being created via this digital revolution.

The Alan Turing Institute is the National Centre for data analytics and artificial intelligence. Its support of this project brings internationally leading researchers in AI and data science to the partnership group. Research at the Turing Institute is channelled around a number of ambitious challenges which represent areas in which AI and data science can have a game-changing impact for science, society, and the economy. The Home Wood project is seen as a great example of where data science can be used to driving lasting societal benefit.

The digital offering

The data scientists identified the following skills and techniques in data science that could be brought to bear on combined efforts to drive evidence based policy decisions — decisions with the potential to make lives better for the people who live in Holme Wood:

- Machine learning techniques (Clustering, Classification, Regressions)
- Agent-based modelling
- Other types of scientific modelling
- Visualization (to support viewing and interacting with data)
- Causal inference (establishing what is causing what)

The data scientists identified the following access to data or support was needed to enable data science to make a contribution to the shared goal:

- Data from different local sectors (emphasis on transportation, schools, health and social services)
- Linked databases
- Access to databases that evolve with time
- Support for different types of data aggregation

(individual, family, neighbourhood, etc.) to guarantee the robustness/completeness of the modelling

- A network of communication to address where bottlenecks (e.g. economic or political) might exist

The following areas were identified as real opportunities to use data science techniques to test place based working: **Health Services; Education; Job Seeking; Social Care; Transport.**

It was agreed across the data scientists that it will be better understanding the upstream determinants of (e.g.) health, and interactions between different services (e.g. health and education) that will play to the strengths of the analytics capabilities offered by the Turing. For example, understanding how physical and mental health impact on an individual (and how social isolation can affect health and wellbeing) — exploring how nutrition affects dental health and how dental health impacts on other aspects of a person's life (e.g. attendance at school).

It was agreed that it was the linking of various datasets that would be the real game changer in the urban analytics approach offered by ActEarly: Holme Wood.

Data analytics

The following points were made by the urban analytics experts:

- There is a need to know what past research has happened
- A metadata catalogue needs to be created
- Time needs to be made available to clean the data
- Support is required to understand what the datasets contain (for instance, what the data codes mean for the variables of interest and how variables may interact with each other)
- There is a need to link the data to get a full system overview: Education, Health, Crime and Transport datasets would create a powerful platform for investigation
- Context is key, and the data need to be interpreted in the light of ethnic and socio-economic backgrounds. This means that proper community representation is required to provide the 'stories' that allow for meaningful interpretation of the data
- It is the practitioners and community 'on the ground'

who have the necessary context-specific knowledge

- There is always human bias in data analysis and this needs to be acknowledged (and appropriate controls put in place)
- There is a need to identify from the outset which stakeholders/clients are involved within any given project
- Data scientists will need to have facilitated contact with people in the right field to get the data that can answer a specific research question
- There is a need to intelligently anonymise the data, thinking about consent and ethical issues in advance

Artificial Intelligence

The following points were made by the AI experts:

- There is a need to bring datasets together
- Temporal pattern mining could be a particularly effective approach
- AI could provide descriptive analysis and help identify trends and statistics (that could then be tested using appropriate scientific methods)
- There is great scope to use predictive analysis: forecasting how a quantity changes in the future
- AI tools could allow for optimisation: if there are limited resources it can be seen how to allocate them in the best possible way
- There would be great promise in using causal interference

- It would be good to create simulation models: estimate things in a different way (e.g. via agent-based modelling)
- Machine learning would allow the collation of qualitative results, and turn these into quantitative results to have a testable hypothesis
- It will be important to make sure the solution fits the problem
- There is a need to be aware of the limitations, and be transparent about the constraints of the techniques

Data Visualisation

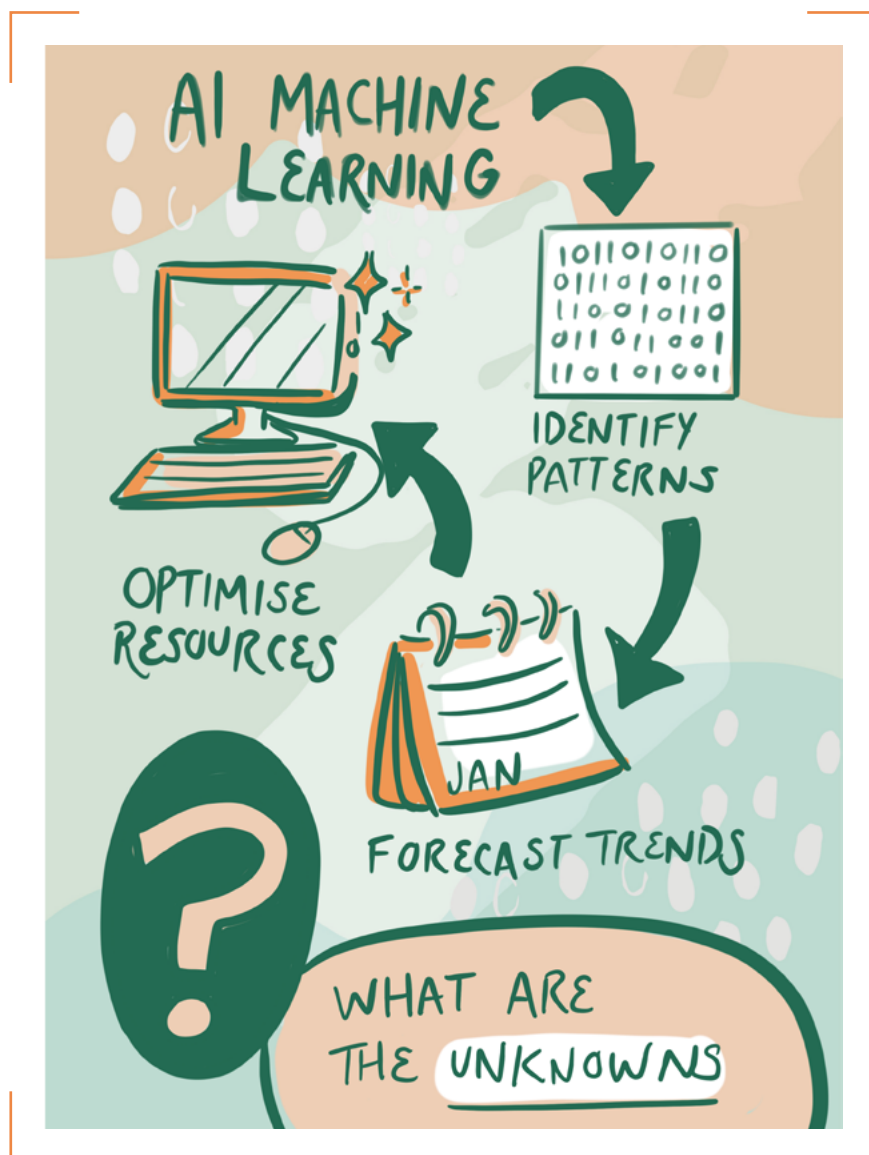
The following points were made by the Visualisation experts:

- Existing visualisation techniques could help with the interpretability and understanding of existing data/results (i.e. assist the way that information is communicated to the community and policy makers)
- These techniques can be particularly useful in communicating the unusual with regards to the average (something that may get lost in reporting the statistics)
- The existing school admissions work is a good example of identifying unusual data patterns — with some schools showing very abnormal patterns of intake
- These approaches can also make the abstract personal — showing things in relatable ways that can inform policy making

- It is often useful to use visualisation to design models before using statistics to gain outputs
- These techniques can assist in the analysis of the data (e.g. investigating data quality: assessing whether there is sufficient data, seeing patterns of missing data, showing different sources, checking compatibility of data sets)
- There is a need to allow a project team to genuinely understand what data are available using visualisation
- The visualisation process itself can also stimulate an idea (e.g. by observing unusual patterns)
- In order to maximise the impact of this approach, there is a need to know what attributes of the data are important (e.g. availability, time and space granularity, names of fields, example values coming from fields, source of data). This should reveal whether all needed data are available or whether more data need to be collected. This can then be presented in a way that's understandable
- There is a need to identify where this overview would sit (hosted on a website?)
- It would be desirable if the data visualisation tool could be queried to a certain degree (e.g. stratifying by age)

General comments

- It was noted that huge amounts of data are constantly generated, and substantial infrastructure is required to host such datasets
- There is a need to make data science meaningful — and this means continually calibrating the findings with the community
- It is important that projects are completed within the agreed time frame
- There is a good opportunity to use the Wolfson Centre and take advantage of the existing expertise in digital science already deployed within the Born in Bradford project
- Studies should be designed in such a way to see that there can be confidence in determining whether trialled interventions have worked (or not)
- Where appropriate, scientists should be encouraged to develop methodologies that advance fundamental research on data analytics and AI and disseminate outputs to the scientific community (e.g. via academic publications) alongside impact-driven activities (e.g. building an evidence base for future government research evaluation exercises)
- Geography and time are important factors that need to be captured
- There is an outstanding opportunity to train a ML/AI model in one location (e.g. Holme Wood) then transfer it to learn another location
- It needs to be recognised that models might not provide perfect solutions
- There is need to use complementary techniques as they tell us different things
- It will be important to involve the community so they can understand the constraints of what is possible
- There is fantastic opportunity to involve children and young people to show them how data science is used
- The involvement of children and young people will allow the development of role models on the Holme Wood estate



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