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A study of the challenges and capability of the re-use of social
care data

By

Malkiat Thiarai MBA LLM

A thesis submitted to the University of Warwick in partial fulfilment of the requirements for
admission to the degree of Doctor of Philosophy

Department of Computer Science

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With populations growing in cities across the world, there is an increasing national and international interest in addressing the issues faced by citizens residing in those cities and by governments responsible for their governance. One feature of the population size is the volume of personal data that is collected by local government authorities in the course of their administration of services operating within the city boundaries. In the UK, large cities, such as Birmingham - the case study focus of this research - collect personal data from citizens, visitors and businesses to provide a wide range of services such as the collection of local taxes, education services, housing provision, leisure and recreational services and social care services for vulnerable adults and children.

At a time when UK local authorities are facing severe financial challenges following a decade of financial cuts as a result of the national government's austerity programme, there is a greater emphasis on utilising those funds available to local government to support the needs and demands from an increasingly ageing and diverse urban population. In order to do this, local authorities are beginning to turn to the vast stores of personal data they hold on their service users to better understand the type, nature, location and cost of historical demand for services in order to understand future demand for services through prediction and preventative measures.

This research considers the issues raised by the aspirations of local authorities to exploit the value in personal data held by them through several routes. The research considers the legal and ethical frameworks that govern the collection, use and re-use of this personal data, it

employs state-of-the-art data analytics and visualisation techniques to analyse multiple years of local government social care data for the city of Birmingham, and how the Council's own plans and strategies for developing its data analytics capacity has been informed by and have informed this research. It further considers how the data is recorded in systems and how this affects the context in which the data can be used.

The research analyses the structure of the data being collected, its attributes, such as personal identifiers, how much data can be utilised for analytical purposes and the obligations this imposes on the subsequent re-use of the analysis. It considers the data flows in operation and how this affects the recording of data associated with the management and delivery of social care services by Birmingham City Council (BCC). The aim is to reveal patterns, trends and insights that may assist in the understanding of recording practices in the creation of personal data records, support decision making process and resource allocation management. This is a data-led study using data derived from personal social care records for adults and children. The outputs from this research have been shared with senior officers within BCC to enable it to learn from the research and deploy the ethical and legal frameworks and data analytical techniques presented in this research to support the local authority in implementing its data strategies to use data in order to meet their obligations protect and safeguard their most vulnerable citizens and the associated personal data.

Dedication

Dedicated to my family.

Acknowledgements

First, I would like to express my gratitude to my supervisor, Prof. Stephen Jarvis, for his guidance, patience, motivation, and support throughout my PhD. I am also grateful to Sarunkorn Chotvijit for his endeavour, good humour, support, and friendship during this period of study.

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I would also like to thank my family for their constant support during my period of study.

Declarations

This thesis is submitted to the University of Warwick in support of my application and is presented in accordance with the regulations for the degree of Doctor of Philosophy. It has been composed by me and has not been submitted in any previous application for any degree. The work in this thesis has been undertaken by me under the supervision of Prof. Stephen Jarvis. Some parts of this thesis are written based on previously published papers (as corresponding or contributory author). Details of all publications are described below.

Spatial-temporal analysis of six-years of social care data from Birmingham City Council is published in:

Thiarai, M., Chotvijit, S. and Jarvis, S. March 2019: "Balancing information governance obligations when accessing social care data for collaborative research" Records Management Journal ISSN: 0956-5698

<https://www.emerald.com/insight/content/doi/10.1108/RMJ-09-2018-0029/full/html>

Chotvijit, S., Thiarai, M. and Jarvis, S. 2018. "Maintaining social care provision in the context of financial austerity." International Journal of Population Data Science.

<https://doi.org/10.23889/ijpds.v3i1.585>

Chotvijit, S., Thiarai, M. and Jarvis, S. 2018. "Big data analytics in social care provision: spatial and temporal evidence from Birmingham." dg.o18 Proceedings of the 19th Annual

International Conference on Digital Government Research: Governance in the Data Age.

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Additional data-led research in the context of budgetary saving proposals is documented in:

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The analysis of data continuity and information flow in the social care assessment process is published in:

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During the period of this research, the author has also contributed to the following academic papers:

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Abbreviations

Adults and Communities Access Point (ACAP)

Agreement ID (ADEID)

Agreements (AG)

Artificial Intelligence (AI)

Assessment (AS)

Assessment and Short-Term Intervention (ASTI)

Birmingham City Council (BCC)

Child Sexual Exploitation (CSE)

Children in Care (CIC) & Court work

Children in Family Justice Data Share (CFJDS)

Children in Need (CIN)

Closure (CL)

Community Referral (CR)

Contact Assessment (CA)

Data Protection Act (DPA 1998) 1998

Data Protection Act (DPA 2018) 2018

Data Protection Impact Assessment (DPIA)

Department for Education (DfE)

Early Education Entitlement (EEE)

Enablement (ENB)

Further Assessment (FA)

General Data Protection Regulation (GDPR)

Geographical Information System (GIS)

Health Information Professionals (HIPs)

Hospital Referral (HR)

IDEA (Data Analysis and Extraction)

Information Commissioner's Office (ICO)

Initial Assessment (IA)

Local Government Association (LGA)

Maximising the Independence of Adults (MIA)

Memory – Identity – Rights in Records – Access (MIRRA)

Ministry of Justice (MoJ)

Multi-Agency Safeguarding Hub (MASH)

Office for Standards in Education, Children's Services and Skills (Ofsted)

Open Database Connectivity (ODBC)

Open Services (OS)

Person ID (PERID)

Reassessment (RE)

Scottish Social Services Council (SSSC)

Service Agreement (SG)

Single view of the Child (SVC)

Social Care Institute for Excellence (SCIE)

Support Plan (SP)

Sustainability and Transformation Plan (STP)

Troubled Families (TF)

University of Warwick (UoW)

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Chapter 1 – Introduction

1.1 Introduction

The motivation for this PhD was developed through the author's involvement in managing the information governance challenges associated with several projects and programmes that, as part of employment at BCC, had a need for the utilisation of data and information, both at an organisational and individual level. The projects involved identifying data and information across organisations and using large scale data to understand and address challenges facing public sector bodies in day-to-day service delivery and assisting in long-term service and resource planning. As much of this data was, or was derived from, personal data, there was a very real data management and privacy challenge that needed to be addressed to be able to achieve specific organisational and operational objectives. These projects and programmes included the following:

1.2 Multi-Agency Safeguarding Hub (MASH)

BCC and its partners in the Health and Police Service developed a solution to improve safeguarding of children within the City. To do so, it was important that all the relevant information from various agencies be available and accessible in one place. A MASH was established to help ensure this and aid communication between all safeguarding partners. By ensuring all statutory partners could share information, it could help to identify in a timely manner, those individuals who are, or are likely to be, subject to harm. This would enable the signatories to this arrangement in discharging their obligations to sharing personal data under the relevant legislative regimes.

Phase 1 of the MASH included partners from BCC Children's Services, West Midlands Police, and the Birmingham Community Healthcare NHS Trust. Subsequent phases would see the MASH expand to include other Health and Education sector partners, as well as third sector bodies.

In general, a MASH helps deliver three key functions for the safeguarding partnership:

- Information based on risk assessment and decision making.

Identify through the best information available to the safeguarding partnership those children and young people who require support or a necessary and proportionate intervention.

- Victim identification and harm reduction.

Identify victims and future victims who are likely to experience harm and ensure partners work together to deliver harm reduction strategies and interventions.

- Coordination of all safeguarding partners.

Ensure that the needs of all vulnerable people are identified and signposted to the relevant partner(s) for the delivery and coordination of harm reduction strategies and interventions.

[1.3 Redesigning services around children, young people, and family's needs](#)

There was a growing move by BCC, in common with other local authorities, to consider and design service provision from the viewpoint of the child rather than the provider. This draws

attention to the number of different service providers who may be in contact with family members and have an influence, direct or indirect, on a child's experiences as they grow up.

This challenges existing structures and service provision models that many public sector organisations have and required new models that have the flexibility to adapt to the city or locality context in which they operate.

Integral to creating new models of service delivery focused around children and young people is understanding how information and data flows as a child interacts within its family and social environment. This, in turn, helps to inform the way in which children and young people interact with universal or targeted services and society as well as the importance of personal and private information being shared.

The types of projects involved in this area have focussed on the need to support the improvement in Children's Services by the Council and, to do so, the Council invested in technology solutions that support key programmes of activity. These included:

- a) Early Education Entitlement (EEE)
- b) Troubled Families (TF)
- c) Single view of the Child (SVC)

These projects were commissioned with IT providers and were designed to address specific issues associated with the respective elements of each project. Each of these solutions made use of a central hub and contained data as follows:

EEE	TF	SVC
Early Education providers	Social Care systems, Youth Offending Service, Education Service systems, NHS, Probation Service, Education Welfare Service, School Census, Housing and Domestic Violence, Police, Solihull Borough Council.	Social Care systems, Youth Offending Service, Education Service systems, Direct school feeds.

1.4 Sustainability and Transformation Plan (STP)

BCC, working in partnership with the local NHS Trusts and a neighbouring authority, Solihull Metropolitan Borough Council, developed a Sustainability and Transformation Plan (STP) to improve the health and wellbeing of people living in Birmingham and Solihull. This would involve the sharing of personal data of older adults within the geographic region to both understand demand and develop relevant and appropriate service provision.

The stated aim of the organisations involved in the STP is for people, wherever they live, to lead fulfilling, healthy, independent lives, whilst being able to access early help as and when they need it, and for appropriate services to be available and easily accessible when people can no longer live independently. The NHS deliver care to patients and families through primary care, community and hospital-based services and local authorities, through social care services, focus on supporting people to live independently for as long as it is possible for them to do so. The work of the STP is to tackle the concerns about the health and wellbeing of communities, including the effects of poverty, obesity, diabetes, cancer, and infant mortality.

However, both health and council services are facing considerable hurdles. In Birmingham and Solihull, as in much of the country, there is an increasing challenge to meet accident and

emergency (A&E) waiting time targets, there are variable levels of GPs and nurses for the population size and there are collective challenges in getting people out of hospital and properly supported in their own homes.

The financial challenges of austerity impact both the NHS and local government. This presents difficulties for councils to continue to provide social care for adults and for the NHS to continue to meet the rising demand for all its services from young and old, as people live with multiple conditions and more complex treatments become available. In addition, support for people with mental health issues is a further challenge.

At the early stages of the development of this initiative, analysis suggested that in order for the Councils and the NHS in Birmingham and Solihull to continue running the services, without any changes, they would need an additional 430 hospital beds by 2020 just to meet demand. To facilitate the work to address these challenges, the STP was established to bring organisations together to create a draft plan to transform the health and care system. This would include the need to collect, share and utilise personal data across organisational boundaries.

1.5 Analysis of personal information relating to those young people identified as being subject to Child Sexual Exploitation (CSE).

The sharing of appropriate information between agencies about children who come to the attention of local authority social services has been vital in ensuring that as far as possible the welfare of children is safeguarded. This work was built on the emphasis in the Children Act 2004 of the importance of safeguarding children by stating that the relevant partner agencies,

which include the police, children's services authorities, Clinical Commissioning Groups and the NHS Commissioning Board, must make sure that functions are discharged having regard to the need to safeguard and promote the welfare of children. The Act also states that they must make arrangements to promote co-operation between relevant partner agencies to improve the well-being of children in their area. Well-being is defined by the Act as relating to:

- a child's physical and mental health and emotional well-being ("be healthy");
- a child's protection from harm and neglect ("stay safe");
- a child's education, training, and recreation ("enjoy and achieve");
- the contribution made by them to society ("make a positive contribution"); and
- social and economic well-being ("achieve economic well-being")

Information upon which safeguarding decisions in relation to children and young people are made is held by numerous statutory and non-statutory agencies. Serious case reviews and inquiries (such as Laming¹ and Bichard²) have directly attributed the lack of good information sharing and communication to the subsequent death of an individual. To deliver the best safeguarding decisions that ensure timely, necessary, and proportionate interventions, decision makers need a holistic view of an individual and their circumstances to be available to them. Information viewed alone or in silos is unlikely to give the full picture or identify the true risk.

1.6 Birmingham City Council: Research, Analysis, Intelligence and Data (RAID)

During 2013, the Council proposed the creation of a Corporate Intelligence Unit (CIU) function, with the following aims:

- Providing reliable, timely position reports, research, analysis, and data on critical issues to drive delivery of the Council's priorities and manage performance.
- Capturing and using intelligence, including ensuring that intelligence from performance monitoring and management, front-line staff, customer feedback, complaints, resident surveys, and other engagement is effectively captured and used to inform commissioning and drive more cost-effective delivery.
- Improving processes, and providing tools and information, to support better decision making, and make it easier to plan and monitor performance more effectively.
- Increasing service quality, e.g. speed and accuracy of real-time information, to enable better control and more efficient resource allocation, to deal with issues.

This activity formed part of a council-wide service review programme, which together need to deliver over £300m of savings over three years enabling the Council's senior leadership team to identify available efficiencies in support services, to minimise cuts in front-line services.

1.7 Research aims, objectives and research questions

The aim of the research is to identify whether BCC can re-use personal data its holds and, if so, how this can support BCC in developing and improving services to its citizens, within budgetary constraints.

Using the BCC projects and programmes highlighted as the context, at the onset of the research, the following research questions were identified for further consideration as part of the study:

1. How can the release of data held within public sector organisations help develop new models of service delivery?
2. How can improved usage of data at an urban level to support service delivery models that are focused around children, but target those at risk and vulnerability?
3. How can public sector organisations balance the rights to privacy and a personal life when sharing information, identifying, and tracking children at risk?

The objectives for this research were to, firstly, identify how the personal data held by BCC could be accessed and set out the challenges and compliance requirements to demonstrate how this can be achieved within legal and ethical frameworks. Secondly, it was to develop reliable analytical capability and demonstrate, through a series of case studies, how BCC can improve processes and increase service quality. The final objective was focussed on demonstrating through a concrete example of how objectives 1 and 2 feed into an investigation into the performance of children's social care in Birmingham.

1.8 Thesis Contributions

This thesis outlines the processes, legal and compliance issues and information governance challenges that need to be addressed in accessing social care data held by a public authority within the context of the organisation's ambitions to improve its data analytics capability to support its stated aims and objectives for delivering services to its citizens and managing its

financial resources effectively. In outlining these challenges and how to address them, this research utilised social care data accessed from BCC, to identify and develop new approaches to data analytics and visualisation for social care data. The research was conducted in conjunction with senior Council officers who helped support the direction of the research and were recipients of the outcomes of the different research case studies that were conducted, with a view to aiding and informing the Council's own practice and direction in respect of developing and sustaining a data analytic capability through the use of practical examples, techniques and visualisations that enabled further internal Council discussions on the capabilities and challenges that were presented by this research.

This research was also undertaken as part of a small data science team at The University of Warwick. Led by Professor Stephen Jarvis at the Warwick Institute for the Science of Cities, the team comprised two doctoral students who were engaged in studying different, but related aspects of data generation and use in the Adults and Children's Social Care Services Departments at BCC. Whilst my PhD colleagues focused upon the novel application of data analytic techniques to analyse data held by BCC, the research underpinning this thesis focused upon obtaining access to personal level data held by a local authority for the purposes of research and applying the analysis for Council plans, strategies and objectives. Joint outputs from this work have been published (listed in the Declarations section of this thesis) and a separate PhD thesis³ examined ('Social Care Service Provision using Spatial-Temporal Data Analytics', submitted to The University of Warwick in partial fulfilment of the requirements for admission to the degree of Doctor of Philosophy in April 2019). The detail of this collaborative working is detailed in Chapter 4.

The analytics were applied to a range of scenarios and case studies to demonstrate the value and insight that can be gained from the data, particularly from retaining personal data attributes within the data that enable a greater granularity of analysis. This included new methods, management, and qualitative and quantitative studies.

The data used in the research was held in 'CareFirst', the social care system for BCC that had been in operation for over 10 years and contained a wealth of data that could be analysed to support the development of effective future service delivery models. The total number of client records held in CareFirst, as at March 2015, was 567,119 of which 74,246 were deceased. There were 120,084 clients under 18 and of these 761 were deceased, but also there were a further 108,138 who had no Date of Birth and of these 1,098 were deceased.

Case studies were developed and are explored in detail in the three contribution chapters. It should be noted that the contribution chapters do not reflect a chronological order in which the research was carried out, rather they aim to introduce different facets of the research that emerged as the study progressed and evolved, identifying new and potentially different areas to explore that perhaps were not evident at the beginning of the research.

The main contributions of this thesis are as follows:

1. The approaches to identifying, categorising and accessing social care data with associated attributes which could then be exposed to novel applications of data analytic techniques allowing for a granular understanding of the past provisioning of social care services and fed back to senior Council officers to inform and direct both

the focus of the research and the Council's strategy for developing its data analytics capability.

2. Data-led research reflecting on different elements of data within the data lifecycle and pipeline that have been recorded as part of the delivery of social care services, the continuity of the flow of data throughout that process to understand data quality issues and how these impact on the secondary use of data captured. These include a range of case study examples that demonstrate how the data can be applied to different aspects of the Council's data analytics capability.
3. The employment of data analytic techniques to examine the creation, utilisation and flow of information within children's social care with a focus on different aspects of how this data is recorded and how the analysis can inform future system developments, recording practice and influence re-use of data as a requirement of data creation.

To the best of the author's knowledge, these contributions are unique within this research domain, particularly as they are focussed on BCC as a case study and, more importantly, the research has been able to access a granularity of data that has allowed for in-depth analysis across the spectrum of social care. The research outcomes have been shared with senior officers in the Council and continue to influence the approach to the re-use of social care data for research purposes as part of the Council's ongoing Information Management Strategy.

1.9 Thesis Outline

Chapter 2 covers:

use of personal data and the legal, ethical and privacy issues

challenges faced within both the adults and children's social care sector

use of technology to improve social care

re-use of personal data held within the social care system

the role of leadership, organisational change and the data pipeline

data analytic techniques, spatial and temporal analysis and visualisations

the legal framework within the UK

Chapter 3 covers:

- the findings of the research to utilise social care data

understanding the data, its structure and accessibility

addressing ethical and legal obligations and requirements of the ethical and governance processes.

research outcomes from data analytic techniques to 'pseudonymised' data

presentation of the research findings back to BCC

reflecting aspects such as location, the ethnicity profile of service users, cost profiles

Chapter 4 covers:

- background to data analytic strategies for the Council

summarises ten case study examples that aim to demonstrate how the data used in the study could develop capability and deliver strategic aims

case study examples to highlight how historic social care data can be utilised to provide a range of different analyses to inform evidence based decision making

case study examples using social care data to support decision-making and resource management based on budget saving proposals

case studies selected for analysis related to proposal to changes in service delivery for adult and children's social care services.

Chapter 5 covers:

- analysis of the research carried out on children's social care data

how information and data are recorded given the recording practice guidance available to social workers,

how system developments influence and alter the nature and structure of the record

how the recording of the data impacts upon the structure and content of the social care record

issues for the service user when exercising their rights to their data.

Chapter 6 covers:

- on the novelty of this research and how the respective contributions from the various elements of the research are distinct from previous research within the same field.

it introduces the areas in which the work featured in the research is continuing within the Council and with external networks and with collaboration partners.

Chapter 7 covers:

- the conclusion from the work presented in this thesis

suggestions for possible future research and techniques could be applied to other types of service data held by local authorities, such as housing, education or leisure services data

Chapter 2 Literature Review

2.1 Introduction

This chapter sets out an overview of the range of literature and related articles considered within the course of this research. It provides an introduction into BCC and the challenges the local authority faces, and continues to face, in managing and providing social care provision for both adults and children within the city boundary. The impact of austerity and the subsequent cuts to budgets and service provision are also outlined. The chapter considers the requirements for researchers seeking to make use of the personal data obtained in the provision of social care services and the obligations and responsibilities imposed in the course of accessing this data for research purposes, including the legal, ethical and privacy challenges that are present.

The chapter further considers the background to social care services provided by local authorities, identifying issues relevant to both adults' social care and the provision of children's social care services. It identifies related research conducted within the social care sector and how the collection, analysis and use of personal data affects policy and practice.

The chapter includes an analysis of supporting literature within the context of smart cities and the use of technologies, data and analytical techniques that have been applied to social care data to inform the effectiveness and efficiency of service delivery, the impact upon service users and citizens and changing approaches to service delivery and policy development as a consequence of the outputs of data analysis.

It also considers wider organisational issues such as the role of leadership, the nature of data and evidence-driven organisations, the methodological uses and consequences of novel visualisation methods and managing continuity across the data pipe-line. Furthermore, it covers the concepts of organisational change programmes and the factors necessary for conducting and making decisions based on secondary analyses in support of organisational aims, objectives, and strategies.

2.2 Birmingham City Council background

This research has been undertaken in collaboration with BCC, the largest local authority in Western Europe. The Council recognises, like all local authorities, that it collects and stores a considerable amount of personal data about its citizens, their circumstances, and the services they receive. For children's social care services, the Council has been rated as 'inadequate' over several years for service provision of social care to its citizens by the UK Office for Standards in Education, Children's Services and Skills (Ofsted)⁴. The organisation was cited nationwide for serious failures in protecting and safeguarding of vulnerable people, as several high-profile child deaths in Birmingham have been reported in the national press since 2003. Furthermore, since 2010, there has been a programme of budget reduction within the UK because of cuts to public service funding. This has resulted in the Council being unable to provide services to people whose financial resources were less critical⁵.

In developing this research, we sought to highlight value which could be obtained from data held by the Council, without having an adverse or detrimental impact upon the individuals whose data have been analysed. We took account of the different elements of personal data held and sought to apply data analytic capability to understand the data that is recorded by

the local authority and how its re-use can support improvements in personal data recording, aid decision making about resource management and inform budget challenges in different areas of the city.

The financial cuts to social services experienced by local authorities in England^{6 7 8 9 10} and changes in the number of people receiving services,¹¹ have resulted in difficulties in supply and eligibility,¹² a reduction in service quality¹³ and an incremental increase in the number of self-funded recipients. The problem of identifying and examining care quality¹⁴ has been limited by the inaccessibility of good data sources,¹⁵ insufficient high-quality care¹⁶ and an increase in deprivation rates.^{17 18}

Birmingham City Council is the local government body responsible for the governance of Birmingham, the UK's largest and most populous city outside of London, with a population of over 1.1 million people and its expenditure in 2016–17 was £3.094 billion, of which £805 million was spent on services for people. Birmingham is divided into ten parliamentary constituencies, each of which elects one Member of Parliament (MP) to the House of Commons. The city is divided into 69 wards, which elect either one or two councillors to be members of the City Council (see Figure 1). The Council was expected to make total savings of £815 million from 2011/12 to 2019/20 and, because of this, the authority reduced staff from 20,000 in 2010 to around 7,000 by the end of 2018.¹⁹

There is increasing interest in utilising information held by public bodies to generate tangible benefits to public sector decision-making in the United Kingdom (UK).^{20 21} As councils encounter the challenges of declining budgets and rising demand,²² it is essential to combine data and technology to improve citizens' outcomes, as well as achieving financial savings.

When seeking to mobilise data driven organisations, a key question facing leaders in achieving this ambition is 'what are the defining characteristics of data-driven businesses and what can companies do to catch up with the leaders?'.²³ Embedding a data culture, improving data literacy and managing the sheer volume of data are often cited as among the main challenges that need to be addressed. However, there is also recognition that organisations need to consider privacy²⁴ and data ethics²⁵ as integral parts of creating the right organisational structure in which data analysis becomes a core component of the way in which the organisation conducts its business.²⁶

It is also important to recognise that data and technology alone do not make an organisation more successful. Rather, it requires a shift in the mindset and efforts from leadership and employees.²⁷ Understanding the role of the organisation's leadership and its position in advocating putting data front and centre in business decision-making, knowing what data exists, and having people trust it, are vital.

Research conducted by PwC²⁸ found that 54% of Chief Executives and 73% of Leaders agreed that Big Data could play a large role in transforming the information and insight of local authorities. However, the report also highlighted that *"master data management standards and policies and clarity on who is gathering what data for what purpose is under-developed*

in most authorities. Very little truly integrated data exists within authorities and across the public sector. The relevant data is often held in different forms in many different places and is not stored in a way that makes it easy to integrate. This will become a major challenge if it is not dealt with."

Birmingham City Council faced similar challenges. In 2013, it commissioned a review of its Research, Analysis, Intelligence and Data (RAID) capabilities in support of the development of a corporate 'one council' integrated approach to intelligence. The vision for the work sought to meet changes in customer expectations and the increasing demands for integrated public services to make the best use of its customer data and intelligence. The review also aimed to address deficiencies in previous programmes by recommending that the future operating model include a leadership contingent that acted as a spine with ultimate accountability for delivery. This was intended to create professional leads and provide accountability, a professional staff body and a strategic integrated approach to plan and negotiate on such areas as data systems with IT providers.

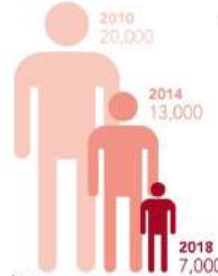
This programme of work was being conducted to manage the impact of austerity measures imposed by government spending cuts at the beginning of 2010 and the figures below highlight the effect on the Council.

Key Messages

Where do we get our money from?



Around 67% of our money comes from central government.¹



What have we already done?

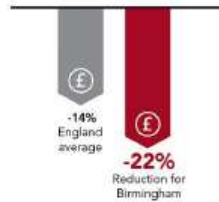
We have already made cuts, for example, through reduced use of buildings. We have reduced the size of our workforce from 20,000² in 2010 to 13,000³ now (2014). We estimate that by 2018 we will employ around 7,000³ people.

Full time equivalent

Source:
1. Birmingham City Council data
2. Census for Shropshire District
3. Department for Communities and Local Government

Our spending power has been cut

The government has made much bigger cuts to Birmingham and the other big cities than the rest of England on average. For Birmingham this has meant a 22% reduction in our spending power between 2010 and 2016.



We have lost out because of historically low council tax rates compared to Core Cities

£24m

The annual loss to Birmingham

£69m

Birmingham would be better off by 2017/18 if the cuts were fair

£150m

The scale of cuts we need to make in 2015/16

Birmingham's Challenge

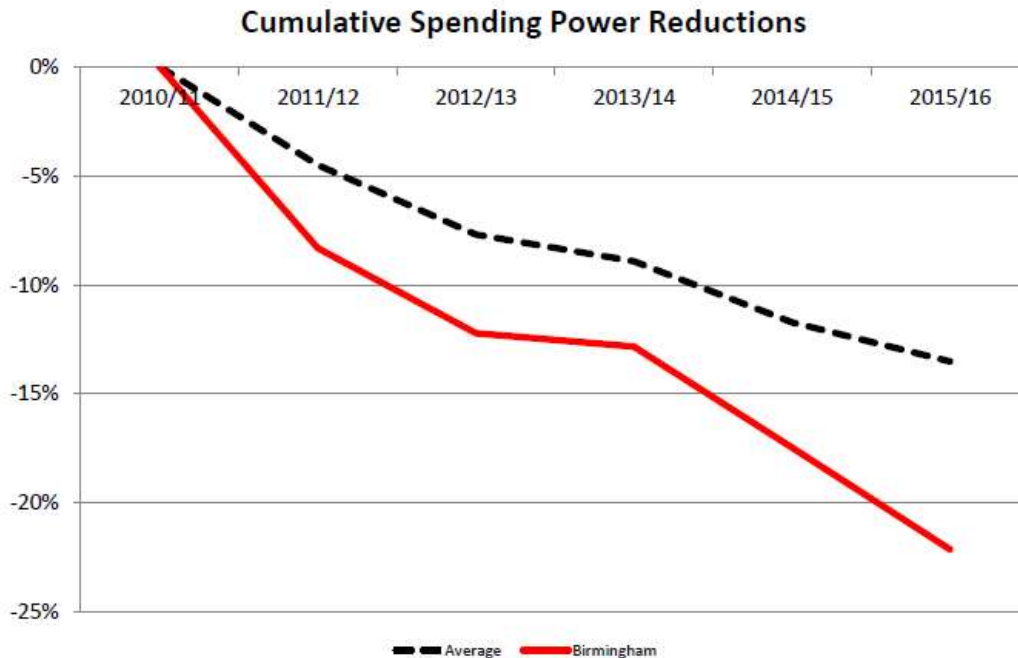


Figure 2: Birmingham City Council financial challenges

Birmingham faces many challenges. The Council is ranked the sixth most deprived local authority in the UK; 40 per cent of the city was identified in the most deprived 10 per cent of areas in England.²⁹ There are significant levels of child poverty; 30 per cent of the city's children live in a deprived household as per the Council Plan³⁰ for 2016+. Life expectancy, which varies significantly between the most and least deprived areas, is 7.6 years lower for men and 6.2 years lower for women than the average found across the remainder of England. Figure 3 below sets out key city challenges from the Council's plan for 2018-2022 highlighting that 1,789 children are in the care of the City Council and that over 12,300 adults are receiving long term support.



Figure 3: Birmingham City Council Plan priorities 2018-2022

2.3 Legal, ethical and privacy issues

Researchers wanting to work with, or utilise personal data within their research, will be familiar with the requirement to ensure that the use of the data meets both legal and ethical standards. In support of these requirements, there are established legal and ethical frameworks within which research using personal data must be conducted.

In the UK, the Data Protection Act 2018 (which repealed the Data Protection Act 1998 in May 2018) is the principal piece of legislation governing the use of personal data. Several additional sources of guidance and good practice are available for researchers in the UK, including the *UKRIO Code of Practice for Research: Promoting good practice and preventing misconduct*³¹ and the *RCUK Policy and Guidelines on Governance of Good Research Conduct*³² that set out key principles to effective research governance.

An international review by Deloitte³³ into the 'Secondary use of health and social care data and applicable legislation' found that across the six countries reviewed (England, Netherlands, New Zealand, Israel, Canada and Australia), all had started to recognise the value of collected health records, but that there was no separate legislation for secondary use of health and social care data in any of these countries, rather privacy laws in each country defined how the personal health and social care records could be used.

It is important for organisations to have clarity as to the legal basis for processing personal data. Where legal obligations are being fulfilled then the basis for processing is provided. Changes to EU law following the introduction of the General Data Protection Regulation (GDPR) in 2016³⁴ have provided for a higher standard for consent compared to previous

legislation. It required that, where there is a requirement for consent, an indication of consent must be unambiguous and involve clear affirmative action and furthermore, be able to be withdrawn at any time.

The GDPR requires that there should be 'granular' consent options for distinct processing operations. It could be argued, therefore, that processing data for research purposes is a distinct processing operation, separate from the original purpose for which the data was collected and, as such, the relevant obligations would apply.

The ICO's guidance on 'consent' concludes

“Consent is one lawful basis for processing, but there are alternatives. Consent is not inherently better or more important than these alternatives. If consent is difficult, you should consider using an alternative.”

As such, in order to obtain access to the data and adhere to the legal obligations imposed upon the processing of the personal data, an early determination made in this research that the basis on which the data could be processed was for research purposes as set out in Section 33 of the Data Protection Act 1998 (DPA 1998). This was because the research began prior to the introduction of the GDPR and DPA 2018. The DPA 1998 did not define 'research'. The ordinary meaning of 'research' is therefore used when determining whether personal data is being processed for research purposes - research is a systematic investigation intended to establish facts, acquire new knowledge, and reach new conclusions. Section 33 of the DPA 1998 made it clear that 'research purposes' includes statistical and / or historical research:

(1) “research purposes” includes statistical or historical purposes; “the relevant conditions”, in relation to any processing of personal data, means the conditions —

(a) that the data are not processed to support measures or decisions with respect to individuals, and

(b) that the data are not processed in such a way that substantial damage or substantial distress is, or is likely to be, caused to any data subject.

(2) For the purposes of the second data protection principle, the further processing of personal data only for research purposes in compliance with the relevant conditions is not to be regarded as incompatible with the purposes for which they were obtained.

In re-using data already captured for an original purpose, researchers need to balance the advantages and disadvantages of utilising the data³⁵ and consider whether the breadth of data captured, its structure and context enable the research question to be answered or does it result in some deviation from the research aim.

Among the challenges faced, one is to allow for an effective and reliable integration of distributed, complex, and diverse data sources³⁶ whilst recognising that, firstly, the information systems may not have been designed to manage security and confidentiality requirements. Secondly, there is a growing diversity in data sources and, thirdly, there is a move from a provider-centred model to a patient-centred model. Furthermore, there is a recognition that secondary analysis of both qualitative data and quantitative datasets³⁷ provides researchers with access to data that was not collected, used, or analysed as part of the primary research question.

In considering re-use of secondary data, it is important to understand the legal context within the UK, that governs the processing of personal data. Changes to the principal legislation in the UK came into effect in 2018, with the UK Government bringing the GDPR into UK law. The data protection principles in GDPR are broadly similar to the principles in the Data Protection Act 1998, as set out below:

Data Protection Act 1998:	GDPR and Data Protection Act 2018:
Principle 1 – fair and lawful	Principle (a) – lawfulness, fairness and transparency
Principle 2 – purposes	Principle (b) – purpose limitation
Principle 3 – adequacy	Principle (c) – data minimisation
Principle 4 – accuracy	Principle (d) – accuracy
Principle 5 – retention	Principle (e) – storage limitation
Principle 6 – rights	No principle – separate provisions in Chapter III
Principle 7 – security	Principle (f) – integrity and confidentiality
Principle 8 – international transfers	No principle – separate provisions in Chapter V
(no equivalent)	Accountability principle

Section 19 of the Data Protection Act 2018 provides for the processing of personal data for archiving, research, and statistical purposes³⁸ and brings into effects the safeguards that Article 89(1) of the GDPR requires for the processing of personal data for those purposes. This section replicates the safeguards set out in Section 33 of the 1998 Act, which required those relying on the “research exemptions” to comply with certain safeguards to ensure that personal data would not be processed by researchers to support measures or decisions with respect to particular individuals, and would not be processed in a way likely to cause substantial damage or distress to any data subject. Additionally, Section 19 of the 2018 Act confirms the scope of provision to processing which is necessary for archiving in the public interest, scientific or historical research purposes, and statistical purposes at 19(1), prohibits where the processing causes substantial damage or distress to the data subject at 19(2) and prohibits where the personal data is processed to support a decision being made about the subject at 19(3).

The 2018 Act³⁹ also provides further derogations to the obligations on data controllers in respect of information rights of individuals when processing data for research:

- a) Article 15(1) to (3) (confirmation of processing, access to data and safeguards for third country transfers);
- b) Article 16 (right to rectification);
- c) Article 18(1) (restriction of processing);
- d) Article 21(1) (objections to processing).

However, the data controller is required to ensure that the personal data is processed for research purposes in accordance with the data protection principles, with particular regard to:

- a) the compatibility of the re-use purpose with the primary purpose of the obtaining of the data;
- b) the safeguards that are in place to protect the individuals and any adverse impact upon them; their privacy and their family life;
- c) compliance with the data minimisation principle to use only the minimum data required for the research purpose;
- d) adopting techniques for pseudonymisation where appropriate;

Demonstrating compliance with these measures and legal provisions will, in turn, enable the data controller to comply with the new principle established in GDPR, the 'accountability principle'⁴⁰ which requires the data controller to be responsible for and evidence compliance with the data protection principles.

There are, however, several challenges that researchers face in understanding the social care data they wish to utilise as well as adhering to a range of different guidance, whether on governance or ethics, issued across the sector.

There is a plethora of sector and professional specific guidance that provides a framework that those working with social care data need to follow. Examples include:

1. The Department of Health (DH)⁴¹ resource pack, which is designed to support the implementation in social care of the DH *Research Governance Framework*. The Framework contains information, guidance, and a range of resources for supporting research governance and is primarily aimed at those involved in setting up and running governance systems in local authorities or for people who take part in the review of relevant research.
2. The Information Governance Review⁴² concluded, as part of its review that accredited safe havens should meet requirements for data stewardship that included:
 - Robust governance arrangements that include, but are not limited to, policies on ethics, technical competence, publication, limited disclosure/access, regular review process and a business continuity plan including disaster recovery.
 - Clear conditions for hosting researchers and other investigators who wish to use the haven.
3. The Department for Children and Youth Affairs in Ireland⁴³ published specific guidance on research involving children, in part driven by the principles of the United Nations

Convention of the Rights of the Child, in particular Articles 2, 3, 4 and 6. The guidance, recognising that there was no single regulatory system and no body responsible for research ethics in the country, set out a number of core ethical principles and concepts that needed to be followed by all those who carry out research with, and for, children in Ireland.

4. The International Medical Informatics Association⁴⁴ developed and published a distinct code of ethics for Health Information Professionals (HIPs). These are individuals who, in their professional capacity, provide health informatics services, and it was argued that they played a unique role and occupied a unique position that was distinct from that of informatics professionals who do not specialise in health care data and who did not work in the health care setting.

5. The Archives and Records Association published a Code of Ethics setting out the standards of professional behaviour expected of archivists, archive conservators, records managers and those occupied in related activities who are individual members of the association.⁴⁵

These examples of ethical and governance practices within different sectors and organisations reflect the views of the UK Information Commissioner's Office (ICO), who noted in the paper on 'Big data, artificial intelligence, machine learning and data protection' when discussing the ethical approaches emerging in the field of data protection that it was:

'notable that these ethical frameworks have been developed not by regulators but by companies and other organisations themselves.'

A further example of an organisation developing its own approach is that of the Nuffield Foundation where the Trustees decided to establish the Nuffield Family Justice Observatory.⁴⁶ The aim of the Observatory is to support the best possible decisions for children by improving the use of data and research evidence in the family justice system in England and Wales. This work is also linked to Children in Family Justice Data Share (CFJDS),⁴⁷ a collaborative project that has resulted in a database of child data linked from across the Ministry of Justice (MoJ), the Department for Education (DfE) and Cafcass' management information systems.

The MoJ's report into this project included a reflection on the 'significant legal issues to overcome in relation to compliance with the DPA' and whilst a formal agreement to share the data was established, challenges remained, not least the unforeseen technical issues associated with IT infrastructures.

Nevertheless, many aspects of these frameworks echo key data protection principles and demonstrate the strong link between these ethical approaches and data protection law.

The EU Data Protection Directive of 1995 made no mention of a human right to data protection. In contrast, the General Data Protection Regulation (GDPR) is framed in terms of rights, with the protection of 'fundamental rights and freedoms of natural persons and their right to the protection of personal data' set out in Article 1 of the Regulation.

Furthermore, with the enactment of the Lisbon Treaty, the Charter of Fundamental Rights of the European Union in 2009 saw, for the first time, a stand-alone fundamental right to data

protection. The significance of this right is discussed by McDermott,⁴⁸ examining the parameters of this right and its links to key values of privacy, transparency, autonomy, and non-discrimination in other legal European statutes.

The opinion of the European Data Protection Supervisor⁴⁹ called for a four-tier 'big data protection ecosystem' to respond to the digital challenge requiring a collective effort, underpinned by ethical considerations. The proposed ecosystem encompassed:

- Future-oriented regulation: urging simpler rules for handling of personal data which stay relevant for a generation;
- Accountable controllers: putting in place internal policies and control systems that ensure compliance and provide relevant evidence;
- Privacy conscious engineering: empowering individuals who wish to preserve their privacy and freedom through anonymity; and
- Empowered individuals: focused on a 'prosumer' environment, consent and control and data ownership.

The opinion called for dignity to be at the heart of new digital ethics arguing that "better respect for, and the safeguarding of, human dignity could be the counterweight to the pervasive surveillance and asymmetry of power which now confronts the individual."

In its submission to the Select Committee on Artificial Intelligence (AI) the ICO commented that:

"Despite robust data protection compliance, the law only takes us so far. We believe that it can be highly challenging to apply certain data protection concepts such as

fairness and relevance to advanced AI applications. For example, empathic computing involves the use of AI to examine an individuals' on-line behaviour. It considers the vocabulary individuals use, the way they input type and the pictures they look at longest in order to assess that individual's mood and deliver content accordingly. This certainly involves the processing of personal data and therefore engages data protection law. However, whilst the pure data protection compliance aspects of using AI in empathic computing and other contexts can be addressed using the compliance steps outlined in the annex, the use of AI raises wider ethical issues of significant public interest."

The range of problems to be found in the practical use of social care data are explored by Gillingham and Graham⁵⁰ highlighting issues such as data integrity, subjectivity in decision making at the recording stage and hidden biases. Furthermore, the paper considered the impact of the extracted data if it is rendered meaningless as a result of removing it from the system as well as the fact that narrative accounts or in-depth social explanations of complex problems may be lost or replaced by simpler descriptions.

The paper also highlights several ethical concerns with consent to use personal data being one and confidentiality being another. In the context of children's social care data, the basis for collecting the data is to meet statutory obligations, so consent at data collection stage is not the issue. One ethical issue is whether the statutory obligations extend to other uses, such as research, which from a legal perspective would be considered a compatible purpose.

Accessing data for research purposes also raises issues of the data quality and the methods for records management in the curation of the data for research, particularly, where it is for a secondary purpose.

A review of 'Digital records management in Australian government' suggested that whilst the basic tenets for records management – create, capture, manage, access, secure, describe and dispose – remains the same, the methods have stagnated and that the method for how we keep and manage records needs to be adjusted for digital times.^{51 52}

The challenges in utilising data obtained in the course of child social work or welfare provision is discussed by Naccarato in Child Welfare Informatics.⁵³ He proposes the possible evolution of this topic as a sub-specialty in social work, highlighting that “concerns exist as the discipline has ties to face-to-face interactions and there is a minimal amount of time available for practitioners and policy makers to focus on data-related needs” whilst at the same time needing to protect and manage sensitive information and data linking capabilities.

As the use of data, data science and data analytics increases in organisations, so does the use of methods for the visualisation and presentation of the data to a range of audiences,⁵⁴ both internal and external to the organisation, in order to demonstrate the value of and impact upon decision making of data that has been analysed. The aim is to provide the viewer an aggregated representation of available data taking into consideration how a person will respond and be influenced by the representation. Time series data techniques, statistical distribution, maps, hierarchies, and networks,⁵⁵ are among techniques used to spot trends, see patterns, and identify outliers as part of the visualisation process.

As the use of Big Data grows and the ability through machine learning to analyse increasingly larger and larger volumes of data, there is a growing body of work that considers the challenges that this raises. Questions addressing how to deploy visualisation based approaches,⁵⁶ what the requirements are for data visualisation tools,⁵⁷ and the future research challenges and emerging applications⁵⁸ are considered, such as the application of data visualisation techniques in the field of Electronic Health Record (EHR) data and other related health care databases⁵⁹ in order to understand the information and the knowledge that the data represent.

The ethical challenges posed by 'Big Data' are also discussed by Metcalf and Crawford⁶⁰ on the emerging ethics divide. The paper argues that big data is stretching the concept of ethical research and that existing ethical regulations promote a particular approach towards 'research subjectivity' that is being eroded by data science. Further, it suggests that the traditional concept of a 'human research subject', that is, what constitutes an intervention, when and how consent should occur and what types of harm are relevant, are out of step with large-scale data practices. The paper questions, 'Who is the "data subject" in a large-scale data experiment and what are they owed?'

Metcalf and Crawford offer a preliminary examination of how critical data studies may generate a theory of data subjectivity, to enable responsible scientific practice with Big Data methods and thereby address some of the ethical issues that exist and avoid the human subject becoming invisible or irrelevant to data science.

The Royal Society and British Academy's report⁶¹ *Data management and use: Governance in the 21st Century* addressed the changing data landscape, recommending a principled approach to data governance and calling for stewardship of the entire data governance landscape. The Academy hosted a seminar to explore the priorities across sectors for such a stewardship body, discussions at which set out governance needs, practical challenges, and conceptual concerns that any such a body could take on.

The UK Government announced in its budget statement on 22 November 2017 the creation of a new Centre for Data Ethics and Innovation to enable and ensure safe, ethical, and ground-breaking innovation in AI and data-driven technologies.

Training needs have been expressed, for example the introduction of ethical thinking at the core of and during the continuing education of all professionals, so that they can develop the necessary analytical tools to respond to ethical situations as and when they arise.⁶² It is also argued that codes should be used to focus on professional duties and virtues as a collective consensus of professional values.

Organisations are also investing in and implementing internal control systems which include a set of elements such as integrity and ethical values.⁶³ This reflects changing attitudes in management in the field of data control and this can, and perhaps should, shape the way data is viewed as part of the overall control objective.

Whilst the benefits of big data and open data are apparent, there is widespread recognition that in exploiting data, organisations may leave themselves vulnerable to breaches in privacy

or data exploitation. The issue of realising the benefits of big data, whilst preventing privacy abuses, has been the subject of two reports published by the White House and analysed by PwC.⁶⁴ In these reports it was suggested that in order to manage expectations, changes were needed in legislation and a wider recognition of issues was needed within organisations. Thus, the use of data and corresponding issues of privacy need to be integrated into the business strategy of local governments to enable ownership, oversight, and benefit, whilst ensuring individuals retain protection to prevent abuse and discrimination.

Matters of privacy and organisational responsibility also feature in work by Rhind,⁶⁵ who cites five data protection categories in this context: personal privacy - in which citizen's information must be concealed; the appropriate role of the state - in disseminating findings appropriately and avoiding misuse; the cause and effect of technology - including risk of data transfer and processing; the lack of quantitative skills - which may impact analysis; and, the misrepresentation of scientific findings.

To address the potential deficiencies within an organisation's approach to its data and ethics standards, it is considered that identifying the right organisational sponsor is one of the key factors in seeking to successfully implement programmes of organisational change⁶⁶ and leaders understanding of how data driven change management⁶⁷ and the potential of new technologies to 'disrupt' the management of organisations⁶⁸ is increasingly seen as core to a successful outcome.

However, research shows that most change initiatives fail to get their intended outcomes and may even limit an organisation's potential and its people.⁶⁹ Understanding the barriers and

reasons for change management failure⁷⁰ in order to make a compelling case for the change⁷¹ and the role that data and investments in big data transformations has on the success or not of the change is critical. This is because the impact covers a wide spectrum of business operations and has implications on people, culture, organisation, processes, reporting and skillset capabilities.

2.4 Social Care background

Social care is a primary and fundamental service provided by local government to support citizens with illness, disability, and vulnerability (including the elderly) within their locality. The challenge of delivering social care to children and adults is not new from a public sector perspective. Social care services in many local authorities have been reported to be ineffectively allocated and have failed in performance evaluations, resulting in injury or death of individuals a result of abuse or neglect^{72 73} and inefficiency and poor allocation of safeguarding services.⁷⁴ In addition, the concept of centralisation proposed by the UK central government to control the nature of service provisioning and its sustainability has also been found to be inconsistent and difficult to manage.⁷⁵

The data associated with this research project is held by Birmingham City Council and is recorded as part of the Council's statutory duty to provide social services, both for children and adults, and these issues are considered in more detail below.

2.5 Children's Social Care

For children's social care, a 'child in need' is a statutory term and is defined in the Children Act 1989 (the "1989 Act"). Any child can be a 'child in need', even if they are living with their family. A child is someone who is under 18 years of age.

There is no need for a court order to be made for a child to be deemed in need. It is the role of a local authority's children's services department to assess and provide services in this regard. Being a child in need is therefore broader than just those children in local authority care subject to a care order, or those provided with accommodation by the local authority under section 20 of the 1989 Act.

Section 17 of the 1989 Act defines a child in need as follows:

- he is unlikely to achieve or maintain, or to have the opportunity of achieving or maintaining, a reasonable standard of health or development without the provision for him of services by a local authority under this Part;
- his health or development is likely to be significantly impaired, or further impaired, without the provision for him of such services; or
- he is disabled.

Under the 1989 Act, "every local authority shall take reasonable steps to identify the extent to which there are children in need within their area", as well as to publish information about the services it provides to children in need (and other groups) and to "take such steps as are reasonably practicable to ensure that those who might benefit from the services receive the information relevant to them". In addition to the services that local authorities provide for

all children, the 1989 Act specifies the range of services that can be made available for a child in need:

- Advice, guidance and counselling;
- Occupational, social, cultural, or recreational activities;
- Home help (which may include laundry facilities);
- Facilities for, or assistance with, travelling to and from home for the purpose of taking advantage of any other service provided under the 1989 Act or of any similar service;
- Assistance to enable the child concerned and his family to have a holiday;
- Maintenance of the family home if the child is in need (but is not a looked after child) and is living apart from their family in order to either to enable the child to live with their family, or to promote contact between the child and their family;
- Day care if the child is under 5 years of age but is not yet attending school;
- Care or supervised activities (either outside school hours or during school holidays) for a child attending any school;
- Providing accommodation to a child and their family;

Consequently, the depth, breadth and sensitivity of data that may be recorded as a result of a local authority carrying out its statutory functions are significant. The volume of data is likely to be much greater than that collected either from an adult receiving social care services or an individual receiving health or healthcare services. A further distinction in the recording of children's data is likely to be the absence of consent for the collection, use and processing of the data given the statutory obligations imposed upon the local authority.

Issues surrounding children's social care have been widely reported by several local authorities in the UK. Serious case reviews into child deaths have led national governments to change the way in which social care performance was monitored and evaluated.⁷⁶ This has resulted in exposing inefficiency and poor allocation of safeguarding services.⁷⁷

One of the additional challenges facing those wishing to use information relating to individuals held by government, is the uncertainty surrounding the extent to which data held and published can be used for comparative or analytical purposes. A study by the Childhood Wellbeing Research Centre, investigated the availability and comparability of statistics related to the safeguarding of children in the UK. This research highlighted divergence in the characteristics of children registered for children's social care across the country, caused in part by a variation in age and ethnicity groups within the published statistics from different areas of the UK. Similarly, a study by Craglia⁷⁸ et al. encountered the issue of data uncertainty for Child Service Plans for Sheffield. Their research found that only half of the data sets supplied by partner organisations met the granularity requirements needed for their analysis.⁷⁹

There is evidence of the use of depersonalised data held by government to support service delivery and planning, particularly in relation to vulnerable children.^{80 81 82} Guralnick⁸³ stated that a well-organised system of early intervention could prevent cognitive impairment in children up to the age of five. In New Zealand, research has been carried out on the use of administrative data⁸⁴ in identifying children at risk. This research proposed using data to support predictive risk modelling as a means of tackling issues of child protection and maltreatment. The study highlighted that whilst modelling could identify instances of abuse

and neglect, the approach was not without risk of stigmatising and discriminating against certain individuals and families.

Thomas and Percy-Smith⁸⁵ took a different approach, citing the effective participation of children and social workers for service planning and provision. They noted that the voice of young people who were recipients of these services could be very important and could help shape the overall strategy of services within local areas.

In recent years, there has been increasing interest in using social care data to highlight growing requirements, improve decision making processes and transforming public services.⁸⁶ This has required greater involvement from different stakeholders on the use of complex and personal data for research, analysis and visualisation.⁸⁷ However, using data and advanced technologies has limitations if the data quality and standards are poor.⁸⁸ Nonetheless, combining data analytics with policy making and the design of public services within the public sector have been shown to improve service delivery.⁸⁹ Many studies have used spatial analysis, most notably Geographical Information Systems (GIS), to analyse issues related to children in social and health care.

Research by Susan⁹⁰ showed biophysical and social vulnerabilities of Georgetown County using methods to calculate an index score using several indicators such as census, demographics, and housing status, before mapping using GIS to create a better understanding of vulnerable areas. In research by Ernst,⁹¹ the rates and distributions of three types of child maltreatment (physical, sexual abuse and neglect) in areas as small as neighbourhoods, were identified to highlight at-risk communities. The approach adopted used least squares multiple

regression analysis and GIS to gain a more detailed understanding of the child welfare system under investigation.

Child service provision plans, including for interventions and funding, were analysed by Besag and Newell⁹² using a novel scoring and clustering technique. Their work supported the detection of rare events, by computing the probability of the number of observed cases given the population at risk.

2.6 Adults Social Care

The social care assessment process captures an important interaction between local government and individuals. According to the Care Act,⁹³ a local authority must have regard to an individual's assessment of their needs, an individual's views and beliefs, their well-being and those of friends and relatives who may be caring for them and must be flexible in terms of individual rights and the participation of recipients in the decision-making process.⁹⁴ Milner et al.⁹⁵ note that the flexibility of assessment is impacted by the fact that assessment is often a continuous process. The proportion of service recipients who require assessment in the UK remains high, particularly for older adults.^{96 97 98 99} 46 per cent of referrals in 2014 received an assessment and, in 2015–16, approximately 0.9 million people received state-funded social care services in England. Changes in demographics adds to the complexity of the assessment process.^{100 101} At the same time, changes to social care services, resulting from minor or major care-planning reviews, should be seamless from the point of view of the care-recipient.¹⁰² This creates significant challenges for local government because needs and outcomes must be serviced equitably, although the mechanism for meeting needs will differ, depending on local circumstances and individual preferences.¹⁰³

Adult social care in England has seen major restructuring over time and this has led to the introduction of concept of ‘personalisation’, where an individual is placed at the heart of service provision to maximise accessibility and reinforce personal solutions.^{104 105} Person-centred services assist individuals in retaining more control over services they receive. There is some evidence that this has led to a reduction in spending on services for older adults by local authorities.¹⁰⁶ However, other studies suggest more mixed evidence for personalised services reducing local authority spend.^{107 108 109}

Budgetary challenges in England since 2010 have resulted in a 26 per cent reduction in financial resources since 2014–15,¹¹⁰ and it has been forecast that this will significantly impact adult social care service provision.^{111 112} The Local Government Association¹¹³ (LGA) estimated that, taking account of future funding and the range of pressures facing councils, local government could face an overall funding gap of £5.8 billion by 2019–20.

Expenditure on social care assessment and commissioning service delivery, including long- and short-term care plans, totalled £13.62 billion in 2016 across five different areas of support: physical, sensory, memory and cognition, learning disability and mental health.¹¹⁴ Alongside the funding gap, councils with social care responsibilities spend roughly 30–35 per cent of their total budget on adult social care.¹¹⁵ The Association of Directors of Adult Social Services¹¹⁶ (ADASS) suggest that necessary savings to adult social care budgets by local authorities—approximately £940million—could not be reached without serious consequences for front line services.

Good-quality assessments are required to support personalisation for the individual. However, it is possible that accessibility to services for people with significant needs might still be limited; social care professionals are still required to make a judgement about eligibility before co-producing a response in accordance with the clients concerns and outcomes they are seeking. Data will also be input in concurrent streams, and therefore the decision-making points could also contribute to rate limiting in the process over time.¹¹⁷ Historically, there has been interest in using case-review systems, monitoring tools that support social work service provision to clients, while promoting the use of new technology for digital based record keeping.¹¹⁸ Using data from existing assessment documents provides the basis for identifying requirements and improving decision making.¹¹⁹

There is an increasing body of work in the public sector related to improving adult social care services, such as how strengths-based approaches can be applied before individuals start receiving service agreements. Provision of high-quality assessment and care management has been a key concern for the Department of Health¹²⁰ and it is claimed that councils have encountered such challenges for at least the past seven years. Local authorities have had to consider cost reduction and process efficiency, whilst conserving the quality of services;¹²¹ improving outcomes and supporting independence may also result in better value for money. Efficiency could be elevated by reviewing and improving assessment and care-management processes, including ensuring consistency of eligibility criteria and reducing assessments not leading to services.

However, the Department of Health¹²² has argued that 'living with independence' may relate to groups of users only and may be overstated for others. Furthermore, authorities under

financial strain had greater difficulty achieving budget-saving plans using this approach. In 2012, evidence was presented of increasing spending on assessments and reviews in twelve of the last fourteen years.¹²³ This was largely caused by the cost and number of professionally qualified employees carrying out assessments. It was stated that savings could be made by altering the mix of employed staff grades and skills and redesigning the care pathway. To enhance the quality of life for people with care and support needs, councils have proposed methods to embed new 'customer journeys' into the care system.¹²⁴

Related studies have explored the relationship and proportion of service provision for children under the age of five and their safeguarding systems.¹²⁵ Other studies have used data-analytic techniques on different applications in the social care domain: for example, decision trees have been employed to improve the decision-making options of social workers in order to improve service outcomes;¹²⁶ correlational analysis has been applied to explore the relationship between service demand, failure demand and workforce stability.¹²⁷

2.7 Cities Background

There is a growing body of work in the public sector related to Big Data and Open Data and how these paradigms could assist in transforming public services. The UK Government Open Data White Paper¹²⁸ described the United Kingdom as a world leader in the public dissemination of data, citing more than 9,000 datasets that were already available through public portals.

In 2011, McKinsey Global Institute published a report on Big Data,¹²⁹ stating that the capture, curation, search, analysis, visualization and storage of large and complex datasets would

generate value across stakeholders in five key domains: health care, public sector administration, retail, global manufacturing and personal data.

A 2012 report by the Policy Exchange¹³⁰ argued that applying the technologies of big data alone was insufficient for city transformation and that, as a minimum, data quality and standards needed to be addressed.

Dasymetric distribution techniques have been used to spatially represent healthcare outcomes. This research highlighted significant differences between rural and urban areas.¹³¹ Research from Yu¹³² highlighted substantial respiratory health problems from child residents near Asian dust storms. The risk was specified using structured additive regression on demographic data and data including air pollutant parameters. The vulnerability of regions to increased infant mortality has previously been identified using Thiessen (Voronoi) polygons, the use of the Moran index and the G-test.¹³³

It is argued that data is a powerful raw material necessary for holding governments to account, driving decision-making, and improving the transparency of public services. However, a report by Yiu¹³⁴ argued that applying technologies alone was insufficient for city transformation and that, as a minimum, data quality and standards needed to be addressed. Yiu's report estimates that performance improvements could result in public sector savings of between £16 billion and £33 billion per annum.

In this digital age, when large volumes of data are produced and stored in local authority systems daily, the advance of data analytic tools and techniques play an important role in

supporting the use of in-house, multi-dimensional data in the most efficient way.^{135 136} Analysis is usually conducted using programming languages such as R^{137 138} and Python^{139 140} and relational database query languages including SQL to manipulate the data and structures.¹⁴¹ These analytic tools can also be used to visualise data from various perspectives to gain added value and obtain new insights.¹⁴²

Data analytics and a holistic data and reporting strategy are increasingly viewed as an instrumental component to every organisational change management (OCM) approach.¹⁴³ The steps¹⁴⁴ that an organisation should be taking to prepare themselves to collect the data they need and invest in their analytics capacity and the role of data scientists in the change management process¹⁴⁵ are also becoming a feature of research in this area, with a recognition that increasingly, the role of data for research and analytical purposes needs to pervade through all aspects of organisational management. This is in order to ensure that commitments in strategy documents to develop and implement a 'data driven' organisation that is evidence led, an organisation must first become data-driven – which also requires a shift in mindset and culture¹⁴⁶ and avoid pitfalls of inertia during adoption¹⁴⁷ that can hinder the value of the investment.

In order to ensure that, for example, commitments made by Birmingham City Council to develop its own data analytics capabilities, do not fail for a lack of understanding of how using and utilising data should be managed and deployed in the same manner as other organisational resources, such as finance and human resources.

To support the ambition of creating a data driven organisation, it is important to know how data is created, managed and stored so that data flow, integration and connectivity is understood in order to recognise how value can be obtained from the primary and secondary purposes for the data.¹⁴⁸ To underpin this approach, it is necessary for organisations to have, at the centre of the critical data architecture, a data pipeline¹⁴⁹ that enables the seamless flow of information between systems and applications. A fully automated data pipeline can aid maximising returns on data through advanced analytics and better customer insights, improved data utilization, improved organisational decision-making and to provide improved mobility and a cloud-based infrastructure.¹⁵⁰

Developing an infrastructure that supports the stated organisational aims is imperative to enable the data to be accessed and analysed. Challenges in the scaling and reliability¹⁵¹ of the pipeline need to be considered and managed as part of the process. Looking into what these pipelines offer, how they differ from other data processes, and how to implement them¹⁵² to best fit the return for the organisation and the pipeline technologies and techniques¹⁵³ that are available to support an organisation in understanding the most optimal solution and approach that meets its needs are further critical issues to address to achieve the stated aims.

In setting out its own requirements, Birmingham City Council articulated its reference architecture ambitions in its Information Communication Technology & Digital Strategy 2016 – 2021¹⁵⁴ with a view to moving away from a siloed approach to technology, applications and supported infrastructure towards a more cohesive approach articulated in a “Transform - Simplify, Standardise & Share” philosophy to enable the business, deliver the successful

outcomes of the ICTD and associated strategies and move to a new 'Reference Architecture' as set out in Figure 4.

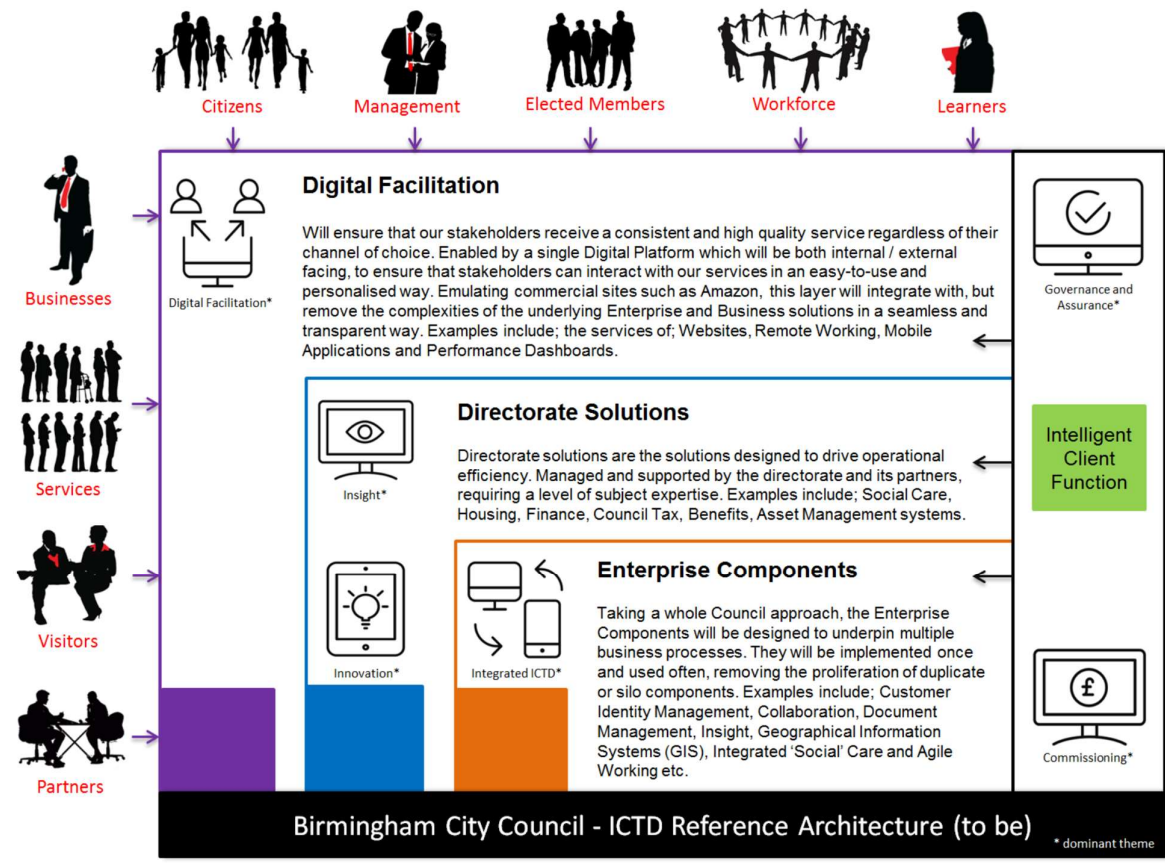


Figure 4: BCC ICTD Reference Architecture (to be)

2.8 Conclusions

The research conducted within the scope of this study has focussed on several elements within the information governance eco-system to improve the understanding of an organisations' compliance obligations to the capture, use and re-use of personal data as part of its wider organisational strategies for developing data analytics capability to drive organisational change. These are outlined in the sub sections below.

2.8.1 Ethical and fair use of personal data for research purposes

The processing of personal data must be fair as well as lawful. To demonstrate fairness, consideration needs to be given to the ethical use of the data. This is because, if the use of the data is considered unethical, it is unlikely that the processing will be fair. As such, even if an organisation can show that they have a lawful basis for the processing, if any aspect of the processing is unfair, it will be in breach of the first data protection principle.

In assessing fairness, consideration should be given to the way personal data is handled and an organisation should only handle personal data in ways that people would reasonably expect and not use it in ways that have unjustified adverse effects on them. This means thinking about not only how an organisation can use personal data, but also about whether they should. Part of the assessment of whether the data is being processed fairly will depend on how it has been obtained.

Furthermore, when assessing the fairness of the processing, it is important to consider more generally how it affects the interests of the people concerned either as a group and individually. If the data has been obtained and used fairly in relation to most of the people it relates to, but unfairly in relation to one individual, there could still be a breach of the first data protection principle.

More broadly, the concept of ethics and ethical use of data need to be bounded by the values and behaviours of the organisation and how the data is used to inform, influence, and direct the delivery of services. A data driven organisation should be able to evidence how it obtains data, how it is used and re-used and how, through its leadership, is able to demonstrate

supporting information governance requirements. These are firstly, transparency, which has been incorporated into the first data protection principle under GDPR, to ensure that organisations set out, for others to see and scrutinise, how data is being used within the organisation. The second is accountability. This is also a new aspect of data protection law introduced under GDPR that requires organisations to be able to demonstrate how they ensure compliance with the data protection principles.

2.8.2 Re-use of pseudonymised data for analytical purposes

Where personal data is used for research purposes, there is a requirement within the law that the processing for archiving, scientific or historical research purposes or statistical purposes, shall be subject to appropriate safeguards and support the rights and freedoms of the data subject. The safeguards refer to the requirement to ensure that an organisation has the appropriate technical and organisational measures in place to protect the data and ensure compliance for the principle of data minimisation.

The introduction of the GDPR specifically references measures that include pseudonymisation of personal data to support this type of processing. These measures can be supported and demonstrated through an understanding of the organisations' data pipeline and how data is collected, maintained, secured, and accessed for its primary purpose. In doing so, process and practice can be developed to access the data for secondary purposes, identifying those attributes that the organisation intends to use in an analytical capacity. Understanding this enables the approaches to visualisations depending on the granularity of data that is being made available and the audience for the outputs of the analysis.

2.8.3 Privacy by design concepts

Privacy by design concepts are a feature of data protection law and are aimed at getting organisations to think about data protection and privacy issues at the forefront of all their activities. The GDPR builds on previous iterations of this concept by introducing it as specific obligations within the Regulation. Articles 25(1) and 25(2) of the GDPR outline the obligations concerning data protection by design and by default, as represented below.

Article 25(1) specifies the requirements for data protection by design:

‘Taking into account the state of the art, the cost of implementation and the nature, scope, context and purposes of processing as well as the risks of varying likelihood and severity for rights and freedoms of natural persons posed by the processing, the controller shall, both at the time of the determination of the means for processing and at the time of the processing itself, implement appropriate technical and organisational measures, such as pseudonymisation, which are designed to implement data-protection principles, such as data minimisation, in an effective manner and to integrate the necessary safeguards into the processing in order to meet the requirements of this Regulation and protect the rights of data subjects.’

Article 25(2) specifies the requirements for data protection by default:

‘The controller shall implement appropriate technical and organisational measures for ensuring that, by default, only personal data which are necessary for each specific purpose of the processing are processed. That obligation applies to the amount of personal data collected, the extent of their processing, the period of their storage and their accessibility. In particular, such measures shall ensure that by default personal

data are not made accessible without the individual's intervention to an indefinite number of natural persons.'

These obligations are intended to ensure that a system designed to capture personal data takes account of the different challenges posed by the nature of the data protection principles that need to be considered in the design of the system. This approach would support an organisation that has ambitions to elevate its use of data and become a data driven organisation. By embracing the 'privacy by design' concept and recognising that an investment in technology infrastructure should incorporate all the known requirements for the organisations data use strategies, it becomes possible to evidence both a cultural shift in thinking towards data as well as achieving a greater return on the investment as a result of a well-defined approach to system design.

By bringing these different elements of the information governance eco-system together within the scope of this thesis, the research seeks to develop these ideas and concepts using social care data to demonstrate the capability and value within the data to support wider organisational objectives whilst outlining processes to support compliance with legal and ethical requirements. This is an area of under-developed work and this research can provide the basis for further research using social care data.

Chapter 3 Access and re-use challenges, and initial results

3.1 Introduction

As highlighted in Chapter 2, there are several challenges in accessing and utilising social care data held by a local authority. This chapter introduces two aspects of access and utilisation that were explored during the research.

Part 1 sets out the processes involved in identifying and obtaining approval for the use of children's social care data as part of this collaborative research between BCC and the University of Warwick (UoW) to demonstrate compliance with the respective legal and ethical frameworks. This work develops the theme from the literature review on ensuring that the use of data derived from personal data obtained for a specific statutory purpose and re-used for research purposes continues to adhere to the legal and ethical obligations placed upon it and, in doing so, does not cause detriment to the individual.

Part 2 provides a background to the Council's plans for developing its data analytics capability through organisational change programmes and initiatives implemented by the Council's leadership team. The research conducted was aligned to the 2016 programme of activity and sets out the findings from the research conducted using social care data provided and presented to the Strategic Director at Birmingham City Council who was responsible, at the time, for adult and children's social care. It outlines the result of analysis conducted on adult social care data using data analytics techniques with an emphasis on understanding the provision of services to citizens within the city boundary. This research was focused on addressing some of the challenges identified in using social care data, its accuracy and quality and applying it within a temporal and spatial context to demonstrate the value that could be

obtained from the data that could inform different aspects of social care provision, whether in terms of understanding service user profiles, geographical dimensions or changes over time highlighting trends in service delivery. The feedback from the Strategic Director was then incorporated into further developing the research focus and impact.

3.2 Part 1 - Exploring Information Governance Requirements

This element of the research sought to use data analytic methods to examine the flow of children's social care data from referral through the assessment process to the resulting service provision. The methodology employed to address the information governance and ethical issues aims to balance the respective obligations of the partner organisations. For example, accessing the proposed dataset for research purposes for the local authority represents a secondary use of data that is deemed to be compatible with the original purpose for which the data was obtained. For the University, however, the data is being processed for the primary purpose of research.

Chapter 2 introduces relevant aspects of the requirements placed on an organisation processing personal data for the purposes of research and the determination that the relevant provisions with the UK's data protection legislation provided the appropriate gateway for the legitimate use of the data. This means that research organisations must adhere to the "relevant conditions" throughout the whole life of the data. It also informs partner organisations at the onset of the research of these conditions and the subsequent limits imposed on the use of the data.

As such, each party needs to document and demonstrate to the other how they meet these respective obligations. Using this research as an example, Table 1 below shows a series of activities undertaken and by whom to demonstrate compliance with the information governance and ethical requirements in respect of this part of the research activity.

	Data Custodian activity	Joint Activity	Collaboration Partner activity
Step 1	Research governance application		
Step 2		Collaboration agreement	
Step 3		Training in data ethics and governance	
Step 4	Ethical approval application		
Step 5			Ethical review and questions
Step 6	Additional information provided		
Step 7			Ethical approval granted with actions
Step 8		Data Sharing Agreement	
Step 9	Data obfuscation and transfer		
Step 10			Data receipt and security measures applied
Step 11			Data retention for research purposes
Step 12		Ongoing monitoring	

Table 1: Data custodian and collaboration partner activity

The key components within the methodology are the initial research governance application within the Local Authority (Data Custodian) and the ethical review process within the University (Collaboration partner) as they establish the boundaries for the research partners in meeting their respective obligations. Both organisations required appropriate training to be undertaken. For the research governance application, this incorporated outlining the legal framework and setting out the scope and structure of the data. The ethical review process allows for the collaboration partner to assess the research proposal in the context of their

own organisational frameworks. How these respective obligations are managed are discussed in further detail below.

3.3 Legal framework

As highlighted above, the Data Protection Act was the principal piece of UK legislation governing the use of personal data. The application for ethical approval was in progress as this legislation was being amended following the introduction of the GDPR¹⁵⁵ in 2016. However, both the 1998 and 2018 Data Protection Acts¹⁵⁶ make provisions for research.

These provisions can apply if you process personal data for:

- scientific or historical research purposes; or
- statistical purposes.

They do not apply to the processing of personal data for commercial research purposes such as market research or customer satisfaction surveys. It exempts the organisation from the GDPR's provisions on:

- the right of access;
- the right to rectification;
- the right to restrict processing; and
- the right to object.

The GDPR also provides exceptions from its provisions on the right to be informed (for indirectly collected data) and the right to erasure. However, the exemption and the exceptions only apply:

- to the extent that complying with the provisions above would *prevent* or *seriously impair* the achievement of the purposes for processing;
- if the processing is subject to appropriate safeguards for individuals' rights and freedoms (see Article 89(1) of the GDPR – among other things, you must implement data minimisation measures);
- if the processing is not likely to cause substantial damage or substantial distress to an individual;
- if the processing is not used for measures or decisions about particular individuals, except for approved medical research; and
- as regards the right of access, the research results are not made available in a way that identifies individuals.

There are some notable changes in the new laws that it is important to consider when using data for research purposes. Firstly, the GDPR requires that “technical and organisational measures” are put in place to ensure that data controllers process only the personal data necessary for the research purposes, in accordance with the principle of data minimisation outlined in Article 5(c). In addition, Recital 33 states that controllers should act “in keeping with recognised ethical standards for scientific research.” Whilst not elaborating any further on what those recognised ethical standards are, the Regulation makes the linkage between research and ethical re-use of personal data.

Furthermore, GDPR Article 89(1) specifically references the use of “pseudonymisation” as a method by which a data controller could comply with the mandate for technical and organisational measures to be in place.

3.4 Understanding the structure of the data

One of the first tasks in preparing the research governance application was to understand the nature of the data held, its format and structure. The data required in this case is primarily collected and stored to support the Local Authority's social care case management. As Best¹⁵⁷ sets out, there are challenges in utilising information that has been collected for a specific purpose in a related level of the organisation and its subsequent re-use for a secondary purpose within another level of the organisation.

To access this data, several meetings took place with Local Authority employees who had detailed technical knowledge of the system, the structure of the data and the changes that had occurred over time (whether technical, legislative or organisational) that impacted the way the data was recorded and categorised. Data was extracted using an Open Database Connectivity (ODBC) connection through Crystal Reports, which is the application in use in the Local Authority. A series of extracts were produced, and the data was then joined using IDEA (Data Analysis and Extraction) software. The information generated was validated throughout and checked against the live application to prove its integrity.

As Gillingham and Graham¹⁵⁸ highlight, data extraction presents one of the key ethical challenges in converting data into a suitable form for re-use. Notably, big data requires that the 'raw data' is available in a format that is better suited to statistical analysis and computation. The problem with this process, as their paper points out, is that the decisions taken at this stage may not only affect the research but may also be invisible in the findings.

This is true to some degree here, in that to understand the structure of the data, we are reliant on the knowledge and expertise of those familiar with the technology to be able to describe what data is held and the relationships between different data types.

3.5 The Data

The data extract shown in Table 2 below is of administrative data related to the social care assessment and agreement process:

Record	Description	Assessment	Agreement
ASM_ID	Assessment Identifier	X	
PERID	Person Identifier	X	X
DOB	Date of birth	X	X
AGREEMENT_START	Start date of the agreement	-	X
AGREEMENT_END	End date of the agreement	-	X
ASSESSMENT_START	Start date of the assessment	X	-
ASSESSMENT_END	End date of the assessment	X	-
SERVICE	Alphanumeric coding of the service	-	X
SERVICE_DESCRIPTION	Description of the service	-	X
ELEMENT	Alphanumeric coding of the element	-	X
ELEMENT_DESCRIPTION	Description of the element	-	X
QSA_DESCRIPTION	Quality Standard Assessment process description	X	-
QSA_GROUP	Quality Standard Assessment process group	X	-
ASSESSMENT_REASON	Reason of taking assessment	X	-
FORM_OUTCOME	Outcome of assessment form	X	-
SERVICE_TEAM	Corresponding assessment team	X	-
SERVICE/ELEMENT_COST	Cost of service/element where available	-	X
POSTCODE	Postcode (unit level)	X	X
GENDER		X	X
ETHNICITY	Ethnic classification	X	X
CLIENT_GROUP	Disability status	X	X
WARD		X	-
CONSTITUENCY		X	-

Table 2: Administrative data fields for social care assessment and agreement extraction

Assessment data details the flow of information through the system of a referral to Children’s Social Care and the outputs from this process. *Agreement data* details those referrals that result in an ‘agreement’ which relates to a service that is subsequently provided to the child.

The data is pseudonymised prior to its release to the researchers. Individual names are removed. However, the 'Person Identifier', which is key to making the data identifiable, is retained. This is to allow for analysis of the data and the number of unique individuals receiving the services. The importance of this level of detail in the research governance application cannot be overstated. This establishes both the intent of the research but also the risks posed to those individuals whose data is the subject of research. For example, retention of the full postcode will allow for much more granular analysis of the data at a geographical level but loss or unauthorised access to the data could allow for the identification of the individual possibly causing substantial damage or substantial distress to any data subject, thereby contravening one of the 'relevant conditions' in s33 DPA that established the legal basis for the research.

3.6 Ethical approval process

The ethical approval process at the collaborating university required all those involved in delivering, supervising, or supporting research (whether staff, students and/or their supervisors) and research support staff (technical and administrative), to complete data governance and research ethics training.

Scrutiny about research ethics and governance is undertaken for each individual research project. If ethical approval is required, this will involve completion of an application form and the supporting protocol. The protocol included two mandatory fields for completion, one of which is the Ethical Considerations, which as a minimum, should contain sub-sections examining Informed Consent, Participant Confidentiality and Data Security.

It should be noted that in the application for ethical approval, confirmation was required that the research was 'limited to the use of previously collected identifiable data' which was reflective of the whole data held in the social care system.

The data selected was solely to support the aims of the research, which is to understand the flow of data through the assessment process and identify any temporal or spatial analysis, errors, data quality issues or other patterns in the data that may inform current practice and processes. Data analysis was to focus on the aggregate number of users. Using Excel, R, Python, and spatial mapping tools including QGIS, the research sought to generate results that showed:

- (i) Service assessments/agreements over time;
- (ii) Service assessments/agreements by time and by postcode district;
- (iii) Number and type of assessments/agreements at different stages in the assessment/agreement workflow;
- (iv) Analysis of assessments/agreements by user type, including age group, gender, ethnicity, and disability, and by commissioning team;
- (v) An assessment of how this analysis might support Council priorities.

This level of detail is an important component in a collaborative research environment as it provides the collaboration partner with background information as to the origin of the data, its structure, how it will be accessed and how the data will be manipulated.

3.7 Information Governance Issues

The review of the submitted ethical application resulted in several information governance issues requiring further clarification ranging from queries on:

- Data minimisation
- Data security
- Damage and distress to data subjects
- Data loss
- Data sharing and
- Data retention.

In reflecting on the information governance issues raised by the reviewers in respect to this ethical application, it is interesting to note that the nature of the issues raised equate to those that the ICO included in their consultation document on what should be considered, assessed and addressed as part of a Data Protection Impact Assessment (DPIA).

A DPIA is a process to help you identify and minimise the data protection risks of a project.¹⁵⁹

This process involves assessing the necessity and proportionality of research plans to achieve its stated purpose, including:

- the lawful basis for the processing;
- how you will prevent function creep;
- how you intend to ensure data quality;
- how you intend to ensure data minimisation;
- how you intend to provide privacy information to individuals;

- how you implement and support individuals' rights;
- measures to ensure your processors comply; and
- safeguards for international transfers.

The next stage of the process required the identification and assessment of risks where consideration of the potential impact on individuals and any harm or damage that might be caused by the processing – whether physical, emotional, or material. The assessment considered whether the processing would possibly contribute to:

- inability to exercise rights (including but not limited to privacy rights);
- inability to access services or opportunities;
- loss of control over the use of personal data;
- discrimination;
- identity theft or fraud;
- financial loss;
- reputational damage;
- physical harm;
- loss of confidentiality;
- re-identification of pseudonymised data; or
- any other significant economic or social disadvantage

The third step in the process was to set out what mitigating measures were to be taken to the risks identified within the assessment. For example,

- deciding not to collect certain types of data;

- reducing the scope of the processing;
- reducing retention periods;
- taking additional technological security measures;
- training staff to ensure risks are anticipated and managed;
- anonymising or pseudonymising data where possible;
- writing internal guidance or processes to avoid risks;
- adding a human element to review automated decisions;
- using a different technology;
- putting clear data sharing agreements into place;
- making changes to privacy notices;
- offering individuals, the chance to opt out where appropriate; or
- implementing new systems to help individuals to exercise their rights.

3.8 Discussion

Many of the risks and issues identified could now be captured by a DPIA in relation to detailed assessment of the mitigation of risks and harm to individuals. The need for these risks to be considered and addressed at the earliest possible stage of the ethical approval process will avoid potential problems later and ensure that the ethical approval is consistent with the use of the data. Any changes identifying new risks and issues would require the need to review the DPIA and the ethical approval obtained.

In setting out the experience of preparing, submitting, and gaining approval for research using social care data, this research sought to highlight some of the key issues identified in this

process and their relationship with current legal processes and requirements. These included: understanding and demonstrating the key legal basis for accessing the data for the purposes of processing it for research; understanding the structure of the data, how it can be extracted and the way it needs to be secured; navigating through the ethical approval process; and responding to the issues raised by the reviewers of the application.

The information governance issues raised by the reviewers of the ethical application for this research demonstrated consistency between the Council and the university collaborators in the approach to accessing the data and the level of scrutiny provided by each was extremely supportive to the research team involved.

The frameworks and structure for the ethical use of social care data continues to be developed and the challenges highlighted may in part be addressed not just through sector specific frameworks but through the approaches organisations take to the capture, use and re-use of data as part of their wider control measures. For example, the impact of an IT governance framework on the internal control environment,¹⁶⁰ which states that the ‘essence of a firm is effectively controlled and represented by the attitude of its management. If top management believes that control is important, the other members of the organisation will feel so and will respond with a conscientious respect for the controls established’, could facilitate a more clearly defined approach to use of data from the onset.

This statement could apply equally to an information governance framework and the approach taken within an organisation, particularly as one of the seven categories of factors in the control environment are the ethical values and integrity standards within the

organisation. In a local authority context approaches to managing ethical and information governance standards could be incorporated into the constitution of a local authority to raise the profile of this topic.

With the introduction of new data protection legislation, there is the possibility of considering how the new law may be applied. For example, while research is not explicitly designated as its own lawful basis for processing, in some cases, it may qualify under Article 6(1)(f) of the GDPR as a legitimate interest of the controller. Gillingham and Graham¹⁶¹ propose that to counter the inaccuracy and incompleteness of datasets, it may be worth developing policies that promote the collection of ever more detailed and full data sets about service users and service activity. From a data protection perspective, this would be considered as 'data protection by design and by default'. The GDPR requires organisations that process personal data to put in place appropriate technical and organisational measures to implement the data protection principles and safeguard individual rights. This means integrating data protection into processing activities and business practices, from the design stage right through the lifecycle and that would include subsequent re-use. This concept is not new however, the key change with GDPR is that it is now a legal requirement. Adopting this approach should also assist organisations in their obligations to be transparent as to the use of the personal data they process and, in turn, demonstrate how they fulfil their ethical obligations to this use and re-use of this data as part of the compliance obligations under the first data protection principle.

The GDPR also contains specific provisions that adapt the application of the purpose limitation and storage limitation principles when personal data is processed for scientific, historical or

statistical purposes and as discussed there are specific obligations within the GDPR that relate to the use of personal data for research purposes. The absence of the consideration of these obligations in research proposals could therefore result in breaching data protection law.

In addition to the GDPR, the UK Parliament has enacted legislation, through Chapter 5 of Part 5 of the Digital Economy Act 2017, that facilitates the linking and sharing of datasets held by public authorities for research purposes.

The power set out in Chapter 5 ('the Research power') broadly enables information held by one public authority to be disclosed to another person for the purposes of research. In making use of this power, public authorities must be able to demonstrate and meet several conditions. These include: establishing processes for 'de-identifying' personal information to be shared under the power; adhering to a published Code of Practice, containing seven principles of data sharing for research purposes, concerning the disclosure, processing, holding or use of personal information intended to collectively ensure that the provision of personal information is ethical and legal under this provision; requiring parties involved in the disclosure of this information to be accredited.

With the introduction of these new legislative obligations and codes of practice in different settings and the range of issues being raised as to the ethical use of personal data, this is an appropriate time for the UK regulator to exercise powers within the Data Protection Act 2018 to publish a Code of Practice specifically related to the ethical re-use of data, rather than allow these standards to emerge as part of either organisational or sector activity.

3.9 Part 2 - Exploring Data Analytics Capability

The second element of exploratory research focussed on data analytics capability using the social care data accessed. BCC, like many other local authorities, has sought to make better use of the data that it holds and analyse this data to enhance city governance and use it in different contexts, such as financial planning and street cleaning optimisation. It is also making aspects of the data 'open' as part of its transparency agenda.

The research was conducted as part of the council's Future Council Programme and based at BCC's offices in Birmingham. The research aimed to investigate:

- a) How data held in local authority systems could be exploited to provide significant value and insight to the local government organisation and wider community;
- b) The extent to which data value is impacted when personally identifiable attributes are retained at the most fine-grained level of analysis;
- c) How the use of local authority data could inform future planning and service delivery in Birmingham, as part of the authority's business planning and budget setting processes as well as supporting the development of the Council's own data analytics capabilities in line with stated organisational objectives.

The research was supported by the Strategic Director in Birmingham City Council with responsibility for adult and children's social care, and as such, has overall responsibility for the data that was being accessed and was a focal point for the output of the research and its subsequent direction. The presentation of these initial research findings was carried out in November 2015.

3.10 Council plans and programmes

As part of its ambitions for developing its analytic capability, the Council had undertaken several projects and programmes to support this process. In 2013, it established proposals for the creation of an integrated approach to the use of data and intelligence. The proposals followed a review of existing practice within the Council in relation to its research, analysis, intelligence, and data capabilities. The review focussed on the improvements that were needed to meet the organisational objectives. It found that whilst good practice took place, it was isolated which made it difficult for this good practice to permeate into other areas of intelligence based work within the organisation.

The review identified several key challenges facing the Council in developing its data analytics capability in a manner that reflected its ambitions. Key amongst this, at the time, was that existing ways of working within the Council often lacked executive and strategic insight into the underlying issues.

Furthermore, there was little systematic strategic response and direction of activities to tackle corporate priority issues resulting in varied success in tackling underperformance. Additionally, the review found that data was not always seen as an important corporate asset and nor was it held in the same high regard as financial data and that activities were not routinely linked to the commissioning cycle.

The proposal for a corporate unit was intended firstly, to utilise resources in the fields of research, analysis, intelligence and data to identify policy priorities, analyse the problem, consider existing evidence to support an appropriate response and ensure robust evaluation

to determine cost benefit. Secondly, it was intended to address the wide variation in the quality of the appropriate skillset required, due to a lack of a clear professional framework for these resources in BCC.

Furthermore, in 2016, as the research for this study had begun, the Council continued with its efforts to establish a data analytic capability through an Insight Programme, which was part of a wider organisational change programme within the Council. As part of the development of this programme, a survey of senior officers was carried out to understand risks, issues and barriers that were relevant to developing a response that could overcome these challenges and move forward with the proposals. The survey responses found the following risks, issues and barriers identified by senior leaders and managers:

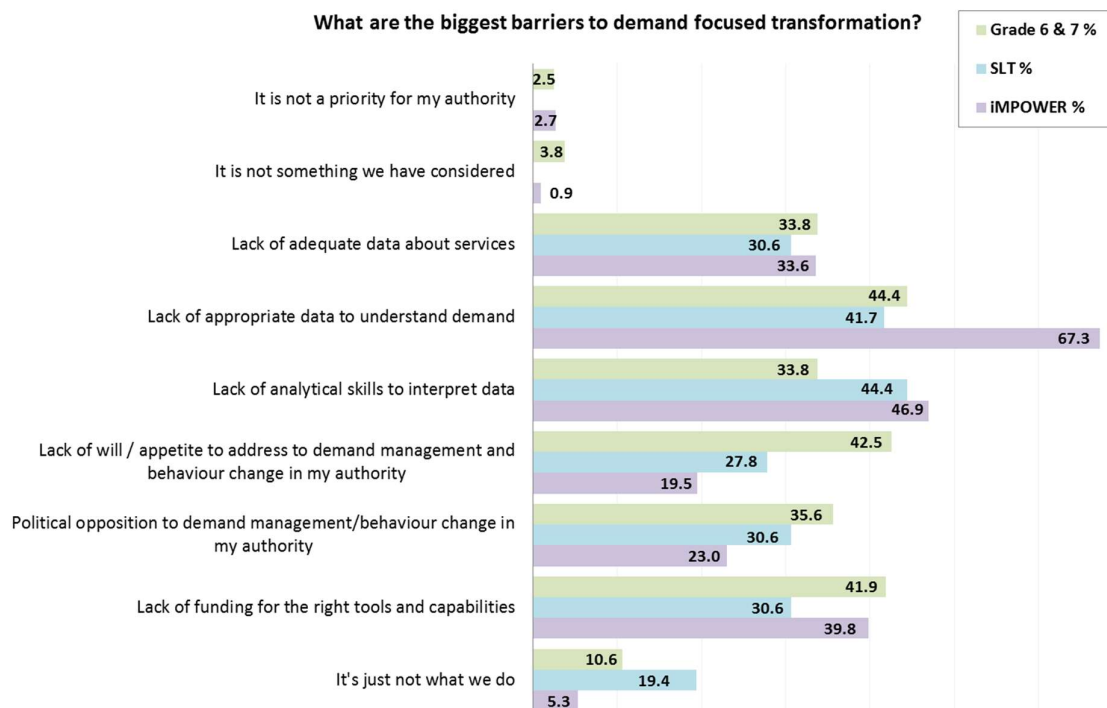


Figure 5: BCC Survey responses

These programmes of activity highlight the nature of the challenge facing the Council, as despite evidence of action plans to address the changes that were being envisioned, the Council found itself in a position of many other organisations tackling similar issues in maintaining the momentum required to sustain a programme of activity that would enable the approach to data analytics becoming a core component of every day work within the Council rather than being a specialist programme of work or a niche area of activity.

3.11 Understanding the structure of the data

The research used the closed agreements dataset from BCC’s internal social care system (CareFirst) which has records of social care provision for all registered citizens over the past 15 years. An agreement refers to a commissioned delivery of a social care service following an assessment, according to an individual level of need and eligibility criteria. In developing the scope of the research, we first had to investigate the nature and structure of the data, how it was recorded and extracted from this system, and in the early stages of the research, limit the research to the following attributes:

DATE OF BIRTH	AGREEMENT START DATE	AGREEMENT END DATE	SERVICE	SERVICE DESCRIPTION	ELEMENT	ELEMENT DESCRIPTION	POST CODE
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The records were then broken down by age groups reflecting the type and nature services that were provided and using Council service models to create the four age ranges.

Age	Number of records
0 - 11	10,000
11 - 25	34,000
25 - 65	47,000
65+	124,000

Table 3: Number of service agreement records by age group

The Agreement ID (ADEID) and Person ID (PERID) normally come in integer form. The Person ID can be duplicated and can include one or more ADEID attached to the individual, but not vice versa. The service and element names are typically stored as a string comprising five or more characters, representing a short version of the full description. A simple coding strategy is employed: a name that begins with CH is related to children; DIR represents a direct payment; HSSU represents home support; LD is related to learning disabilities; MH is related to mental health; OA refers to a service element for an older adult; PD represents a service for people with physical disabilities and, SM represents a service connected to substance misuse. For example, CHEFODIS stands for Children External Fostering Disabled and PDEHSUPP represents the service for Physical Disabilities External Support Living. Table 3 below expresses a sample of these codes with their descriptors by way of an example.

Element Name	Element Description
CHEFODIS	Children, External, Fostering, Disabled
DIRCWD	Direct Payments, Children with Disabilities
HSSU65PL	Home Support, 65 Plus, External Community Based
LDEHSQDS	Learning Disability, External, Quick Discharge Service
MHEBLACT	Mental Health, External, Block Activity
OAICINT	Older Adults, Interim Care, Internal
PDEHSUPP	Physical Disabilities, External, Supported Living

Table 4: CareFirst element names and description examples

Postcode use in this research required the researchers to preserve the anonymity of individuals but, at the same time, be fine-grained enough to provide meaningful spatial analysis. A postcode can be divided into three levels: district, sector, and unit. An example of a relevant postcode is 'B1 1AA'. The district postcode accounts for those letters and numerals before the space, representing part of the city. While the sector code includes one more numeral after the space to display a deeper level sub-area of that district. The unit code

denotes the street or address level of that sector and is the most granular level of the address system.

This study used spatio-temporal analysis to identify the potential areas that may require improvement in social care service provision. The analysis excluded any possible outliers from the data, which could otherwise distort the overall results. Table 4 highlights the respective variables used for this research from the dataset and their respective 'spatial' and 'temporal' designation.

Variable Name	Variable Type
Postcode	Spatial
Coordinates	Spatial
Agreement Start	Temporal
Agreement End	Temporal
Element Name	Temporal
Element Description	Temporal
Weekly Cost	Temporal
Age	Spatial and Temporal

Table 5: Spatial and temporal designation of dataset variables

3.13 Presentation of the initial findings

A meeting was arranged with the Strategic Director with responsibility for Social Care to share the initial findings of the research, to outline the approaches taken and to obtain feedback on how the research could be focussed to address challenges that the Strategic Director, both as a head of a service and a member of the Council's leadership team, faced.

The presentation focussed on five different types of analysis that had been conducted as part of this first phase. The aim was to demonstrate the capabilities within the data, the skills and

knowledge required to manipulate the data and present it and to highlight different methods of visualisations.

3.13.1 Spatial-temporal matrices

The presentation to the Strategic Director began with a demonstration of the high level data using spatial-temporal matrices to explore data quality and conduct anomaly detection. The analysis began with postcode districts (rows) and the years 2001 to 2015 (columns) and built a frequency table of the number of registered agreements for each district in each year (see Figure 6). Data outside these geographical and temporal boundaries were removed and colour gradation (green to red) was used to highlight those areas with higher concentrations of registered agreements.

The series of matrices, presented below, allowed the researchers to identify and focus on key elements of the findings from the data that had been extracted from the system. It included:

- a) A focus on the key timeframe for where the data was most prevalent, namely 2009-2015 (figure 7)
- b) Examples of unusual provisioning of services by specific postcode or year (figure 8)
- c) Areas where there appeared to be improvements in service delivery (figure 9)
- d) Areas that appeared to be particularly challenging, again within specific postcode or year (figure 10)

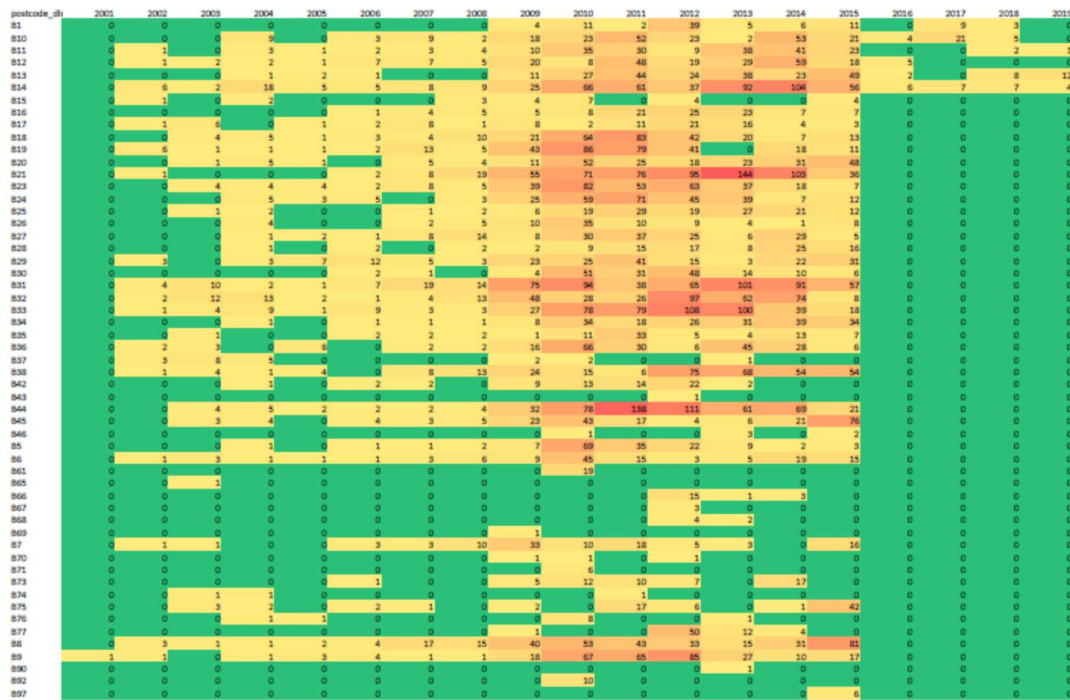


Figure 6: Analysis to data - heat map postcode / year



Figure 7: Data prevalence 2009 - 2015

Unusual pattern of provisioning, 2009-15

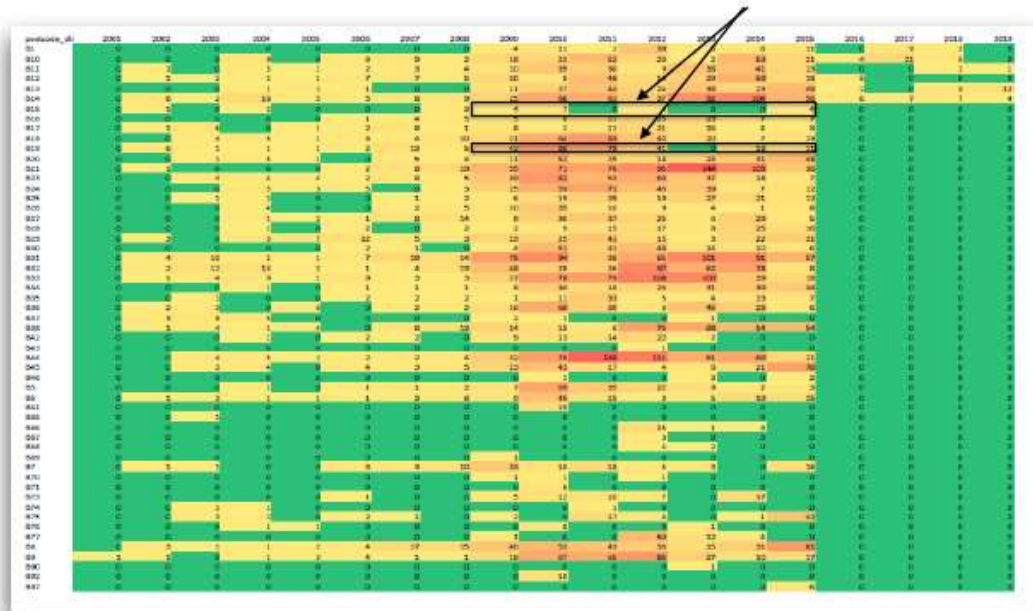


Figure 8: Patterns of unusual provisioning

Improving areas, 2009-15

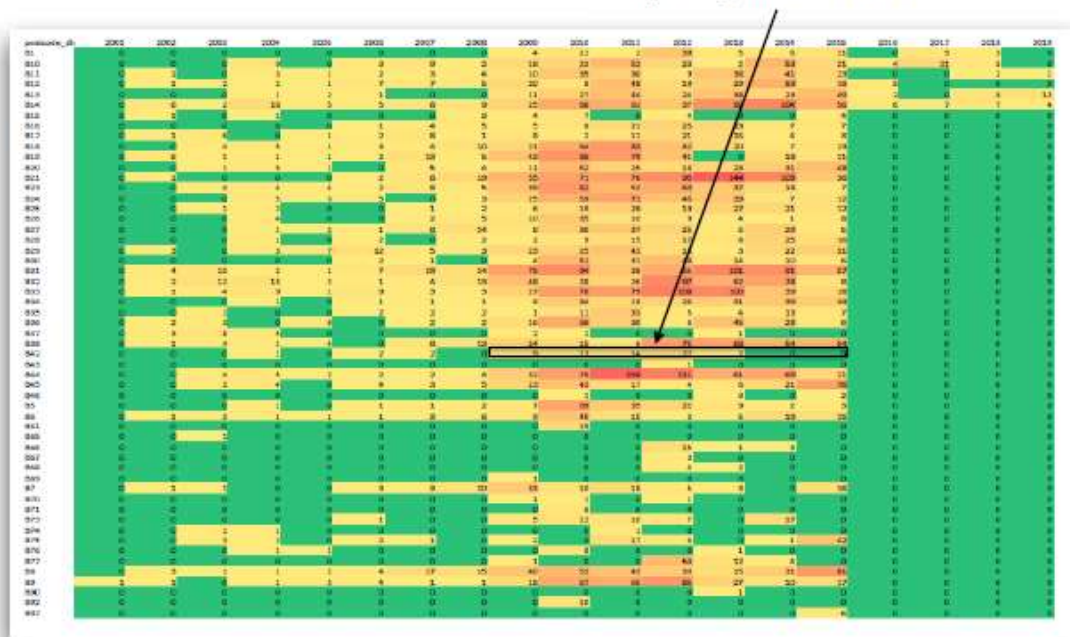


Figure 9: Areas of improvements in service delivery

Particularly challenging 2 years, 2012-13

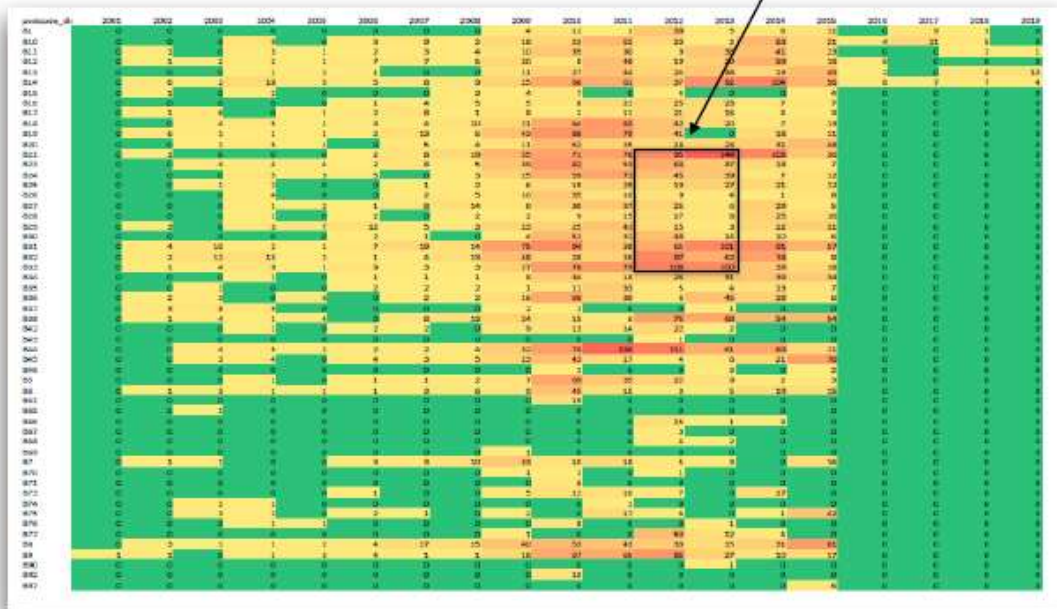


Figure 10: Particularly challenging areas 2102-13

These results allowed the researchers to present a high level analysis of the dataset. As well as highlighted some key issues from the analysis, it should also be recognised that this represented as single dataset and that the researchers needed to remain cognisant to data quality and recording issues and qualify the results accordingly.

3.13.2 Density Heat Maps

The next type of analysis was using heat maps, using one of the age groups as an example, showing the distribution of services being delivered to that age group over time. Figure 11 shows the high level results, displaying the full dataset within the Birmingham boundary. The darker the colour the greater volume of services that were delivered.

Figures 12 and 13 build on from this analysis and consider the distribution of the services by postcode area and at district level to begin to identify possible trends and patterns that are emerging.

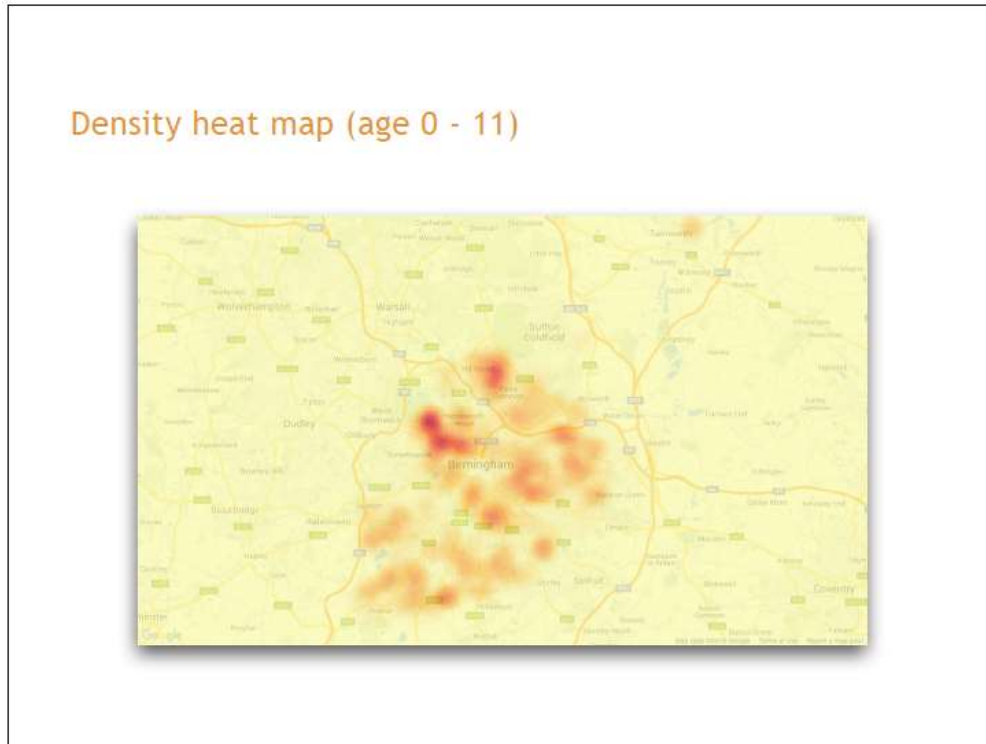


Figure 11: Density heat map Birmingham city region

Density heat map (age 0 - 11)

Postcodes of particular interest: B21; B31; B44

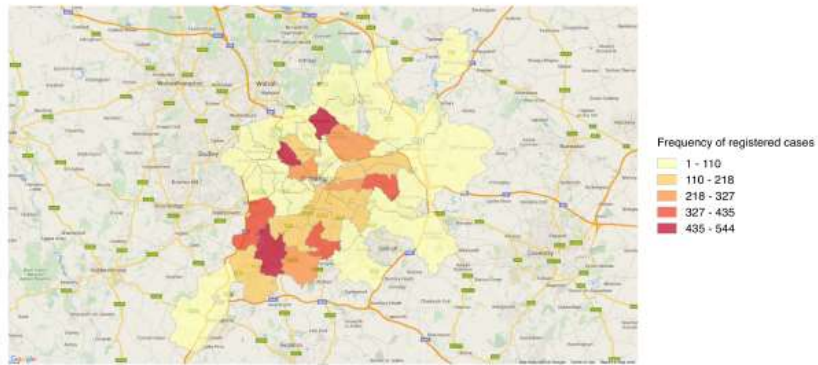


Figure 12: Density heat map 0-11 postcode level

Density heat map (age 0 - 11)

Districts-level analysis



Figure 13: Density heat map 0-11 district level

The density heat map offered a view of the distribution of the elements and demonstrated that the dataset could be broken down and analysed by emphasising different attributes, such as the age of the recipient, to show where services are delivered within the city region, thereby enabling further discussion and assessment of historical provisioning patterns with a view to informing future plans.

The different types of presentation, as set out in these figures, also provided the researchers the opportunity to demonstrate to the Strategic Director the variation in analytic techniques capable from the dataset and associated attributes.

3.13.3 Distribution of elements

The third example looked at broadening the analysis of the distribution to the different types of service and element descriptions that were present in the dataset to provide more detail as to the pattern of service delivery. Figures 14, 15 and 16 represent the findings at a city and ward level, whilst Figures 17 and 18 break the data down to postcode level. This was a key finding that we were keen to highlight as it reflected the benefits of retaining postcode level data, although pseudonymised, in order to drill down to the specific localities and understand the impact of service delivery at a local level and to specific groups of service users over a period of time.

This is one of the key advantages of a local authority re-using, for research purposes, data that it has collected for a primary purpose, that is, to deliver services to its citizens. In understanding this and recognising the responsibilities that the Council has, and continues to

have to this data, it can ensure that it uses it appropriately and in compliance with its legal and ethical obligations.

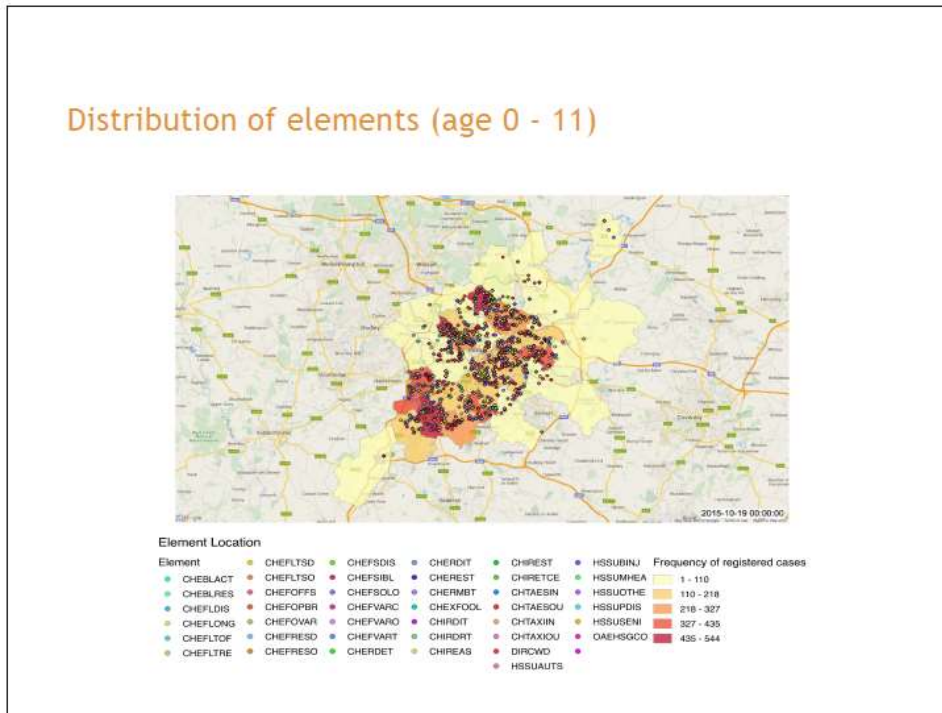


Figure 14: Distribution of elements 0-11

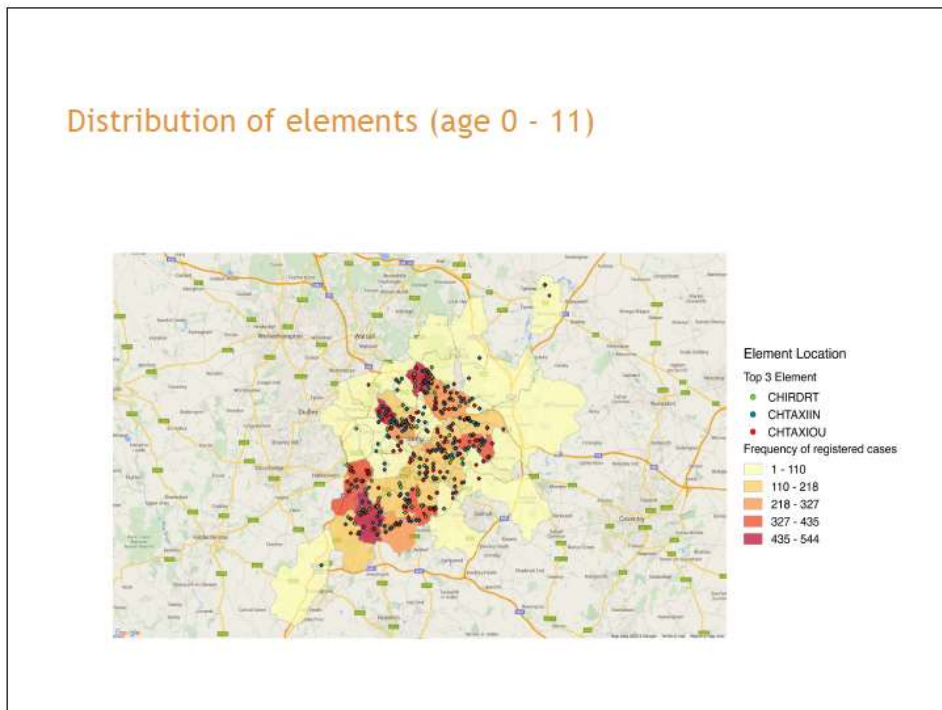


Figure 15: Distribution of elements 0-11 top 3

Distribution of elements, sub-ward, (age 0 - 11)



Figure 16: Distribution of elements, sub ward level 0-11

Distribution of elements, B21 8, (age 0 - 11)



Figure 17: Distribution of elements, B21 8, 0-11

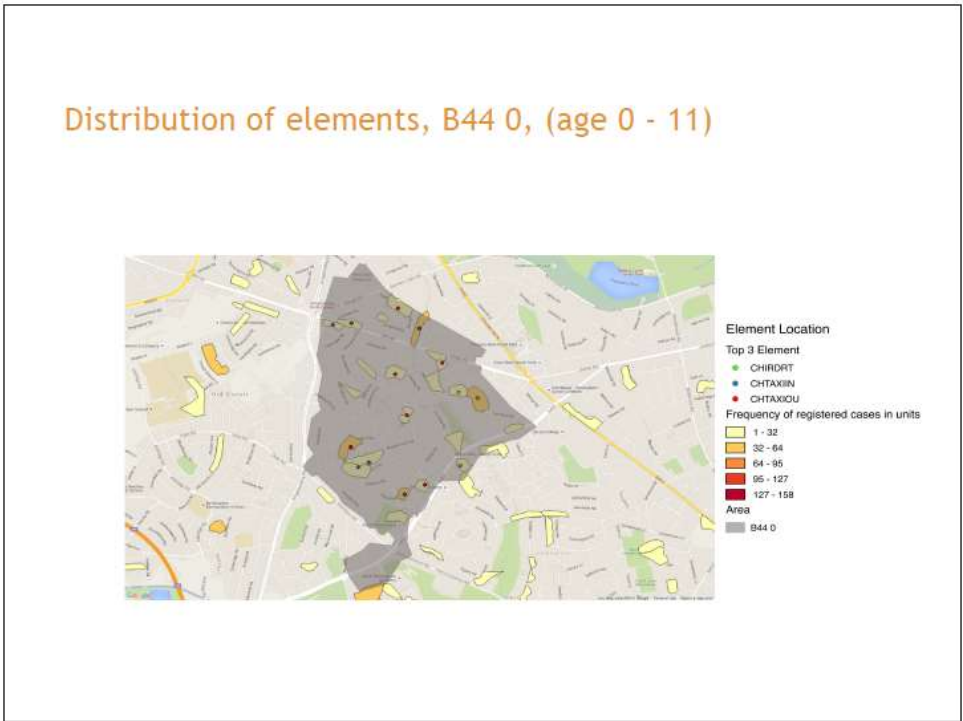


Figure 18: Distribution of elements B44 O, 0-11

As can be seen from this group of graphs, by retaining the pseudonymised data within the dataset, it was possible to present the analysis at a localised level and to show very specific service delivery patterns over time, by age of recipients and service type. This type of analysis and presentation is not without risks as any unintended release of additional attributes may lead to the identification of the individuals whose personal data has been used as part of the dataset to conduct the research. This was a particularly significant piece of feedback for the Strategic Director in order to understand both to understand the capability within the granularity of the data but also the potential risks facing the Council and ensuring those risks are subsequently managed to continue to gain the benefit and value from the data in its possession.

Spatio-temporal analysis, B21 8, 2009-15, age 0 - 11



Figure 20: Spatio temporal analysis, B21 8, 2009 - 15, 0-11

As with the presentation of the distribution of elements in the third example of analysis, this fourth example is not without risks if the wider dataset is exposed and it is possible to identify individuals from the resulting data. More significantly, in this type of analysis, as it could depict the receipt of services for an individual over a period of time, there is a greater risk of exposure of the private and personal life of the individual as it reflects their relationship with the local authority in terms of the services they receive, the location of the services and the length of time that they are in receipt of the services.

Again, part of the feedback to the Strategic Director in exploring this type of analysis, was to highlight the 'risk and reward' associated with creating analysis at such a granular level and acknowledge the ongoing responsibility for data protection and privacy that continues to exist for the organisation to demonstrate as it re-uses the data for research purposes.

13.3.5 Registered services

The final piece of analysis was to present details of services that had been registered and delivered to highlight the most common services being delivered and, again, the initial findings focussed on the analysis of the whole dataset. Figure 21 and Figure 22 represent examples of main service delivery types for a 6 year period. Figure 23 and Figure 24 highlight the services provided to unique individuals within the dataset and which services are the most prevalent and finally, Figure 25 highlights analysis that aims to link service users with multiple service requests.

Analysis to date - services registered 2009-14

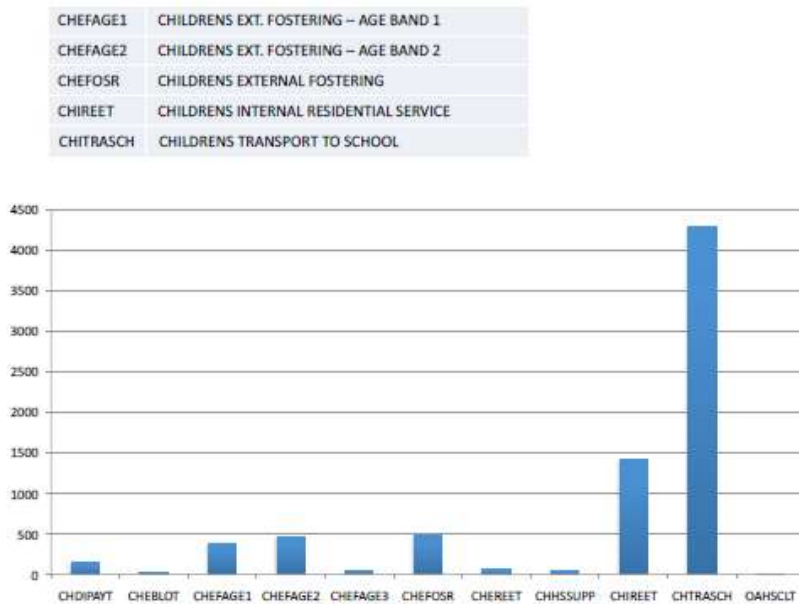


Figure 21: Services registered 2009-14

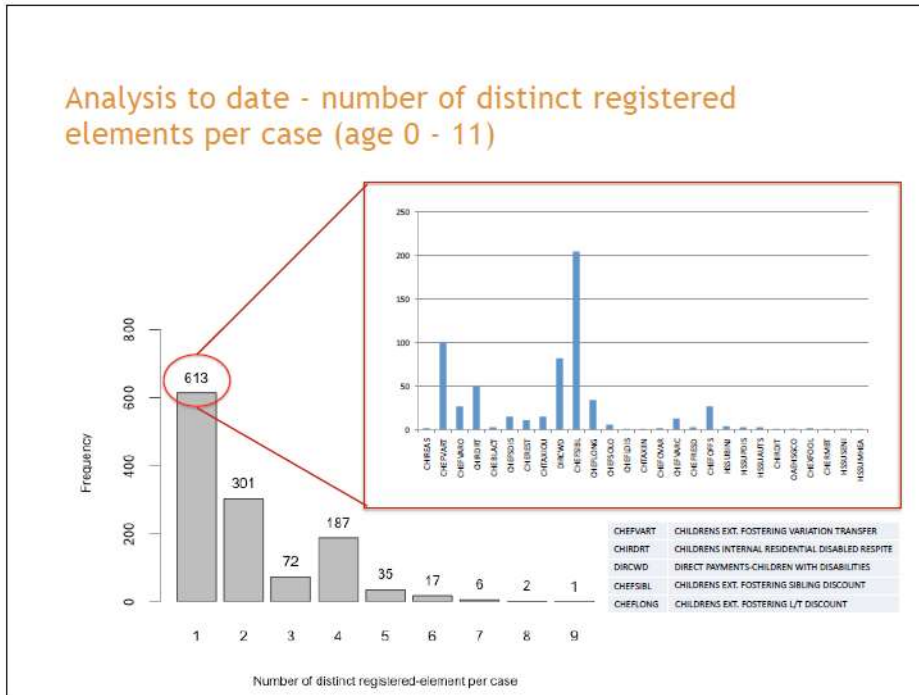


Figure 24: Number of distinct elements per case 0-11

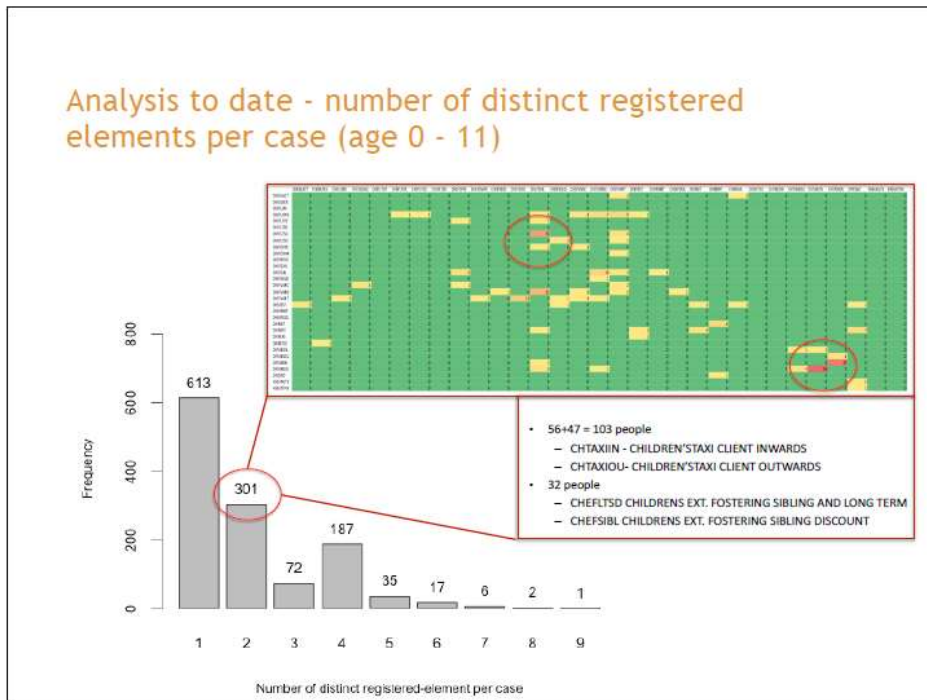


Figure 25: Number of distinct registered elements per case 0-11 example

This final example of analysis was primarily focussed on the types of services being delivered based on the number of instances that each service type was recorded and appeared within the dataset. This analysis was intended to highlight the main types of service being delivered to service users, again based on age groups, and could be repeated for each of the age ranges, or subsets of the ages, within the scope of the dataset. This was also used to highlight recording practices and the existence of different types of services and the frequency of the use of each recording type and this can help in understanding the take up and services over time and therefore inform how service delivery may need to evolve to reflect changes over time.

3.14 Discussion

The research outcomes set out in the chapter provide an analysis of the steps taken to understand, access and utilise social care data held by Birmingham City Council. The first part of the chapter considers the requirements for obtaining the data from the Council within the legal and ethical framework that exists to ensure that the personal data contained within social care records is used in a manner that is consistent with its purposes and with the purposes of the respective organisations involved in conducting this research and benefiting from its outputs. Demonstrating compliance with relevant data protection and ethical obligations provides a clear signal that the organisations understand their responsibilities to the data that has been obtained by establishing a clear purpose and focus for which the data will be used, namely, in this case, the assessment of social care provision across temporal and spatial contexts.

Most significant in this initial phase is the recognition that the outputs of the results cannot be used to negatively impact those individuals whose data has been processed for the

purposes of this research. To that end, all data were depersonalised before receipt (all identifiable attributes were removed), so that it was not possible for the researchers to identify individuals or groups of individuals. This is a critical element of the research focus that needs to be maintained throughout the research project as to jeopardise this undermines not only the legitimacy of the research but also the reputation of the organisations involved.

The development of this research began with understanding the structure of the data and being able to connect the different attributes together to allow for the level of granularity of the analysis set out in the findings. This is particularly relevant to the notion of compliance with legal and ethical requirements. By retaining the personal identifier from the social care system together with the full postcode, along with the other attributes such as age, gender, disability and ethnicity, the researchers retain a significant proportion of data that, in the event of a data breach or other release of the dataset would potentially enable the identification of individuals and thereby lead to a breach of the data protection principles.

This allowed the research (and the Council) to demonstrate compliance with Section 33 of the 1998 Act which required that (a) the data are not processed to support measures or decisions with respect to specific type of individuals, and (b) the data are not processed in such a way that substantial damage or substantial distress is, or is likely to be, caused to any data subject.

Furthermore, the Act states that the further processing of personal data for research purposes (in compliance with conditions, (a) and (b) above), is not to be regarded as incompatible with the purposes for which it was obtained. It is within the parameters of these

conditions, and under the jurisdiction of the Councils ethics and governance procedures, that this research is conducted.

Whilst the Act clearly defines parameters for our research, our study falls into a common class of problem - the desire to understand aggregate information about data, without exposing data about individuals themselves. This problem is well understood in the context of population census studies (the 2016 Australian census was criticised for this very reason¹⁶²) and as a result, an emerging collection of methods, including differential privacy,¹⁶³ have been developed to ensure anonymisation in large sparse datasets.

Whilst there are risks associated with the use of even depersonalised data, it should be recognised that, if appropriately utilised and by following relevant legal, ethical and organisational requirements, the data can provide evidence of continuity of service and public good and improve the operations of public services in the UK and beyond.

Once the structure of the data was understood and the appropriate security safeguards were put in place, the next stage of the workflow could begin with data extraction, ingestion, cleansing and spatial-temporal analysis to derive a data model suitable for further analysis and manipulation and presentation back to the Council and senior officers.

The second part of this Chapter highlighted the efforts of the Council in establishing its own data analytics capability to support its ambitions to become a more data driven and evidence focussed organisation to deliver service improvements and address the financial challenges that it is facing. Within this context, the Chapter introduces the presentation of the initial

findings of the research study to the Strategic Director with responsibility for social care with the view to obtaining feedback to provide direction and focus to the research in order to support the Council, its data strategies and plans.

The presentations focused on five different types of analysis that were conducted using the data. This was intended to highlight how the different attributes within the data together with the volume of data and the period it covered could be analysed from several different perspective and provide a basis for a repeatable set of processes.

The five types of analysis utilised a range of visualisation techniques such as heat maps, spatial and temporal analysis, the geographical distribution of elements and services registered as well as granular analysis to postcode level that was designed to highlight the value of retaining pseudonymised data that can provide for significant insight at a very localised level, leading to evidence and analysis that could enable targeted responses to support local service needs.

If the approach adopted to accessing the data, understanding its format and structure, the type of analysis conducted, and the technical skills required to conduct the analysis that was demonstrated in the presentation, were to be applied at a greater scale, it could be argued that this would begin to support the Council in addressing some of the risks, issues and barriers identified in the reviews into its data analytics capabilities of 2013 and 2016.

The presentation and the feedback from the Strategic Director resulted in three outcomes in which the research could progress. These were:

- a) A further commission from the Strategic Director to widen the dataset from the CareFirst system to include gender, ethnicity, religion, and disability information as well as cost profiles to enable more detailed analysis to be carried out;
- b) Further presentations to other senior officers within the Council and to the Insight Programme to use the research as a case study to identify the resources and skills needed to undertake the analysis and demonstrate the capability that is available from data held in local authority systems;
- c) The creation of an internship opportunity to support the in-house development of Council staff and further develop the use and understanding of data analytics capability within the Council.

3.15 Conclusions

UK local authorities face severe financial challenges because of decreasing financial settlements and increasing demands from growing urban populations. At the same time, there is significant national interest in tackling issues surrounding the needs of vulnerable children and adults. This research aims to support this challenge, by using state-of-the-art data analytics and visualisation techniques to analyse local government social care data for the city of Birmingham. The analysis shows a range of different approaches to utilising and presenting the data, including: (i) service profiles over time; (ii) geographical dimensions to service demand and delivery; (iii) patterns in the provision of services, and (iv) the fact that significant data value can be extracted from closed data with the right data cleansing and privacy filters. Patterns and insights are presented that may assist in the understanding of service demand, supporting decision making and resource management, whilst protecting and safeguarding the city's most vulnerable citizens.

We show that the quality of data collected by the council is significant and, whilst the amount of data studied here is relatively small, we highlight that even that amount of data can, if extracted and organised effectively, produce results that can support a wide-ranging set of objectives.

Using data and understanding the data pipeline, the connectivity of the different attributes within the data allowed the researchers to present a story through the use of a series of visualisations to demonstrate how the research, if replicated, could support the Council in advancing its own plans for developing and implementing data analytics capability. The support of the Strategic Director in this regard is crucial and reflects the need to ensure that senior level sponsorship and buy-in is critical in these instances. This is not just about accessing the data and having access to senior officers to present the findings to, but it is also critical if the Council is to address the risks, issues and barriers that have been identified in the RAID and Insight programmes of work. These programmes have shown that whilst the determination and willingness to develop and make better use of data is a Council ambition, backed up with resources and programmes of activity, the issues raised in both 2013 and 2016 highlight that progress has not been made significantly to enable the success of these programmes and provide significant value and insight to in-house local government teams.

BCC is expected to make savings of £815 million over the nine-year period 2011/12 to 2019/20. Delivering savings of this scale, whilst protecting and safeguarding the most vulnerable citizens within a growing urban population, is one of the biggest challenges facing

the UK's second largest city. Data-led research such as this offers significant opportunity to facilitate and understand such change.

The emphasis of the research in this Chapter has introduced the requirements for accessing personal data held by a local authority and presented the initial research findings and how they shaped the future direction of the research. The outcomes of the next phase of the research and the impact upon the Council and its practices is the focus of Chapter 4.

Chapter 4 Building Data Analytics Capability to Achieve Strategic Aims

4.1 Introduction

As highlighted in previous Chapters, the City Council has made numerous attempts to develop data analytics capability and improve the use of data to inform its decision making processes, improve its infrastructure to support this capability and deliver improvements in the provision of services to its citizens during a time of financial crisis.

These include the programmes of work to support data analysis work (RAID and Insight) and the Council's 5 year IT&D Strategy¹⁶⁴ approved by the City Council's Cabinet in 2016, which includes as one of its six themes the following statement, *"Insight: Become more data centric – so we can create the capability to turn information into insight."*

This Chapter builds on the presentation and feedback from the Strategic Director and outlines, through a series of case study examples, how data held by the Council in its social care systems could be utilised and inform a range of activities related to the management and use of data within the Council in support of achieving the aims set out in its stated information and data related policies and strategies.

During my research, I worked collaboratively with another PhD student and the work presented in this Chapter is a result of this collaboration. The specific findings of the different case studies have been published in the journal papers referenced in the Declarations section of this thesis and also feature in the PhD thesis submission titled 'Social Care Service Provision using Spatial-Temporal Data Analytics', submitted to The University of Warwick in partial

fulfilment of the requirements for admission to the degree of Doctor of Philosophy in April 2019.

More specifically, I contributed to the papers through the development of the research challenge and providing BCC background and context, including understanding of the structure and content of the data to be used for the research. I also contributed to the development of the methodology for the research and the case study examples, again using my knowledge of BCC to focus the direction of the research. I reviewed the outputs of the research findings and contributed to the discussion, leading the data analytics, including data cleansing, data workflow and statistical analysis and finally, led the translation of the findings back to the Council, linking the research outcomes to Council plans.

Elements of this research have already had an academic impact, including receiving the 2018 Best Management Paper Award at the 19th Annual International Conference on Digital Government Research, Delft, The Netherlands.¹⁶⁵ The case studies presented in this thesis have also featured in publications across the academic spectrum including the International Journal of Population Data Science,¹⁶⁶ the Records Management Journal¹⁶⁷ and the British Journal of Social Care¹⁶⁸ highlighting the cross sectoral impact of this research.

Drawing on my contribution to these joint outputs, this Chapter therefore focuses on the ten case study examples and how they can be used to build on and support the development of the Council's plans and strategies and demonstrate how the data held could be used to inform different aspects of Council activity.

The case study examples are summarised to demonstrate how data can be re-used to support the achievement of three aspects of the stated aims, repeated over time, of the Council's ambition in its information and data strategies, to improve its use of data to inform its direction and priorities. These are, as set out in 1.6:

- a) Providing reliable, timely position reports, research, analysis, and data on critical issues to drive delivery of the Council's priorities and manage performance.
- b) Improving processes, and providing tools and information, to support better decision making, and make it easier to plan and monitor performance more effectively.
- c) Increasing service quality, e.g. speed and accuracy of real-time information, to enable better control and more efficient resource allocation, to deal with issues.

The first group of case studies were aimed at demonstrating how the data could be utilised to provide analysis and featured changes to the contractual framework, services to disabled children and older adults as well as a geographical element.

The second group of case studies focussed on an analysis of data flows within Council processes to determine data quality issues, efficiency gaps and compliance with a view to improving processes.

The final group of case studies was used to apply the data to budget reduction proposals to provide additional insight and evidence to support the decision making process and bring about changes in service quality. These are set out below:

Data Strategy Theme	Providing reliable research, analysis, and data	Improving processes	Increasing service quality
Case study examples	A new contractual framework	Qualitative exploration of data flow in the assessment process	Promote Independent Travel and Reduce Reliance on Council Funded Transport
	Residential respite care for disabled children	Identifying anomalies in the assessment process	Internal Care Services - Younger Adults Day Care
	Care services for older adults	Characteristics of completed stages	Internal Care Review - Home Care Enablement
	Three Regional Hotspots		

4.2 Providing reliable research, analysis, and data

The first set of case studies were developed following feedback from the Strategic Director and build on the dataset initially obtained for the first phase of the research, through incorporating additional attributes related to the delivery of services of social care service users and these are set out below in Table 6.

The additional attributes included personal profile information such as ethnicity and disability data, where it was held, and the weekly costs of the agreements so that a financial perspective could be incorporated into the analysis and provide feedback on the costs of service provision over time, by location and service type.

Attributes	Description
ADE ID	Agreement ID
PERID	Person ID
DOB	Date of birth
Agreement Start	Start date of the agreement
Agreement End	End date of the agreement
Service	Alphanumeric coding of the service
Service Description	Description of the service
Element	Alphanumeric coding of the element
Element Description	Description of the element
Postcode	Postcode at unit level
Gender	None
Ethnicity	Ethnic classification (using census categories)
Disability	Disability status
Weekly Cost	Weekly cost per one agreement element

Table 6: Data attributes

Age Category	Number of Records (approx.)
0-11	7,300
11-25	26,000
25-65	47,000
65-90	133,000

Table 7: Number of service agreement records by age group

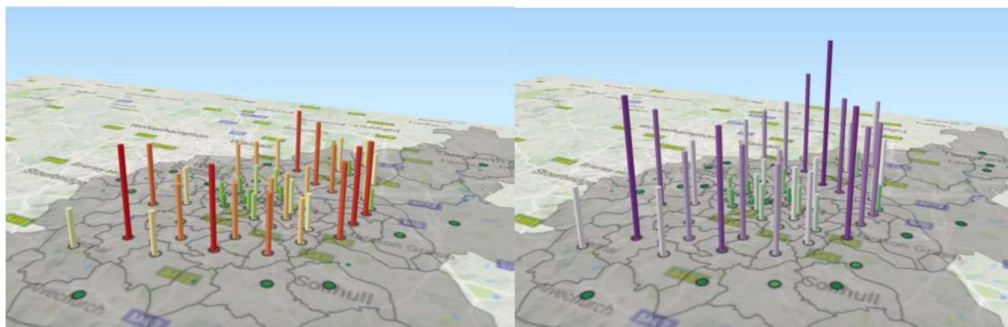
4.2.1 Case Study 1 - A new contractual framework

The first case study highlighted changes to a block contract purchasing of adult social care provision. The focus of the analysis related to the two most frequently commissioned services which were:

Service element	Element Description	Frequency
OAHSOCO	Older adults External General Contracted	72,860
HSSU65PL	Home Support 65 Plus External Community Based	55,199

Table 8: Most frequently commissioned services

The findings were presented and focussed on different aspects of the data. The first set out in Figure 26 show the geographical spread of services elements and service users across the service types. The second was the variations in the service provision between the two service types by postcode area and the third highlighted the ethnic profile of the service users.



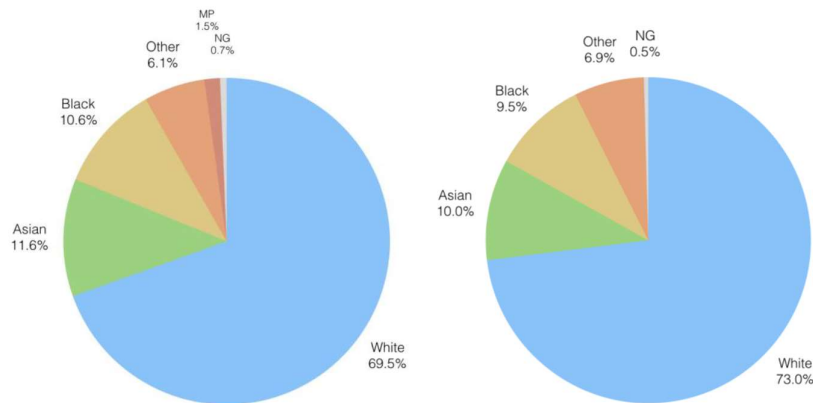
(a) HSSU65PL

(b) OAHSOCO

Figure 26: Geographical dispersal of the HSSU65PL and OAHSOCO service elements across.

Postcode	OAEHSGCO	HSSU65PL	Total	Difference
B23	1,254	564	1,818	-690
B24	816	426	1,242	-390
B75	645	261	906	-384
B26	952	569	1,521	-383
B42	690	332	1,022	-358

Table 9: OAEHSGCO and HSSU65PL agreements for difference postcodes in Birmingham.



(a) Ethnicity profile HSSU65PL

(b) Ethnicity profile OAEHSGCO

Figure 27: Ethnicity profile of the recipients of HSSU65PL and OAEHSGCO

4.2.2 Case Study 2 - Residential respite care for disabled children

This case study focussed on provision of residential respite care for disabled children with the emphasis on the numbers of disabled children supported by the Council over a six year period and the variations of the numbers supported which accounted for approximately £55 million of Council spend on care services over the six-year study period.

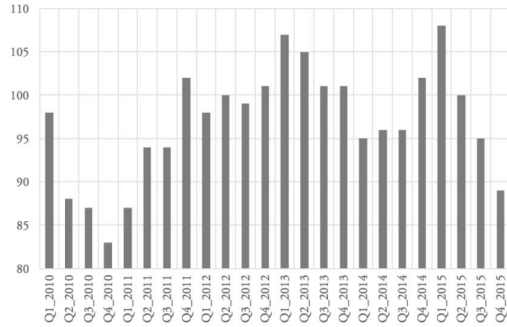


Figure 28: Unique registered users for CHIRDRT over six-year period

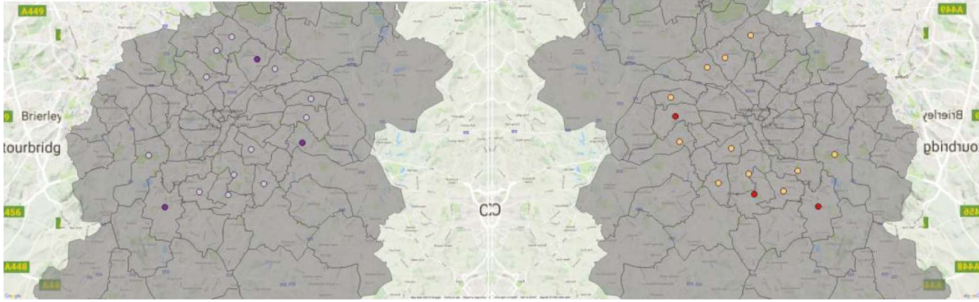
The results showed that the number of unique registered users in each quarter varied by as much as 20%. Unlike the first case study, in which service elements had a significant cost and frequency, this case study highlights that although the cost and frequency of service agreements are also high, the number of service users is comparatively small, see Table 10.

Condition	Q1_2010	Q1_2015
Number of unique registered users	98	108
Number of unique users between Q1_2010 and Q1_2015	76	86

Table 10: Comparison of records between Q1 2010 and Q1 2015

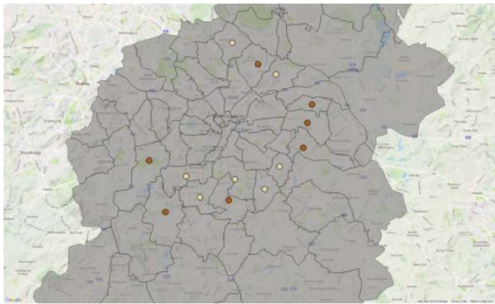
4.2.3 Case Study 3 - Care services for older adults

The third case study focussed on the delivery of older adult care. The Council provides housing support and enablement for older adults both through a commissioned service from external providers (a) OAEHSCGO (Older Adults External General Contracted) and (b) HSSU65PL (Home Support 65 Plus External Community Based) and as a provider of the service itself (c) OAIHSENB (Older Adults Internal Home Support Enablement). The analysis in Figure 12 showed the concentration of the three service elements in question between 2010 and 2015. The ‘outer ring’ pattern is clear for all three service elements and indeed there appears little difference in the externally provided service HSSU65PL and the internally provided service OAIHSENB.



(a)OAEHSGCO

(b)HSSU65PL



(c)OAIHSENB

Figure 29: Postcode regions with the highest concentration of the three service elements between 2010 and 2015

4.2.4 Case Study 4: Three Regional Hotspots

The fourth case study was used to understand issues of budget reduction and the focus of the analysis was narrowed to the district level for comparison purposes. Three areas of the city, one Northern, one Southern and one Eastern, were chosen based on having a population of approximately 50,000 people and with a high density of recipients of service users.

Regions	Postcodes	Population (approx.)
Northern	B16, B18, B19, B20, B21	45,000
Eastern	B9, B10, B25, B26, B33	45,000
Southern	B13, B14, B30, B31	65,000

Table 11: Postcodes within the 3 areas of interest and the estimated population

Analysis of each of the three areas were carried out and results were presented highlighting the proportion of the population that contained unique individuals within the dataset, the

ethnic profile of the service users and the subsequent geographic spread of services and ethnicity.

(where do they live, age and ethnicity)

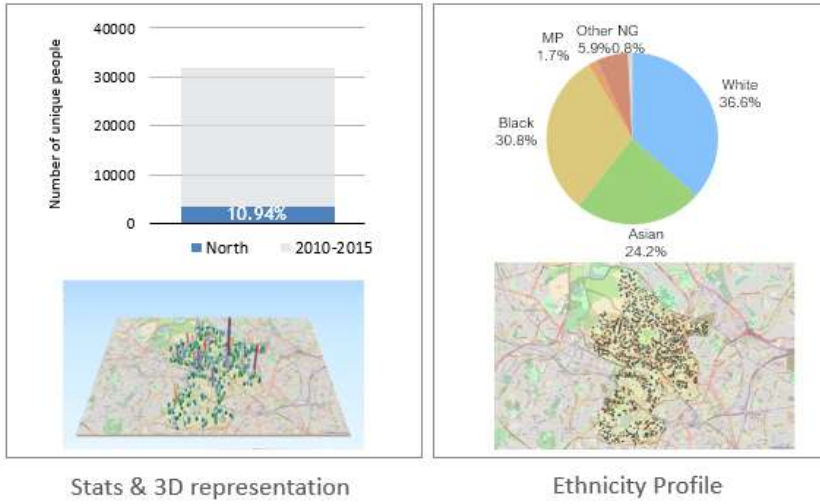


Figure 30: Northern area

(where do they live, age and ethnicity)

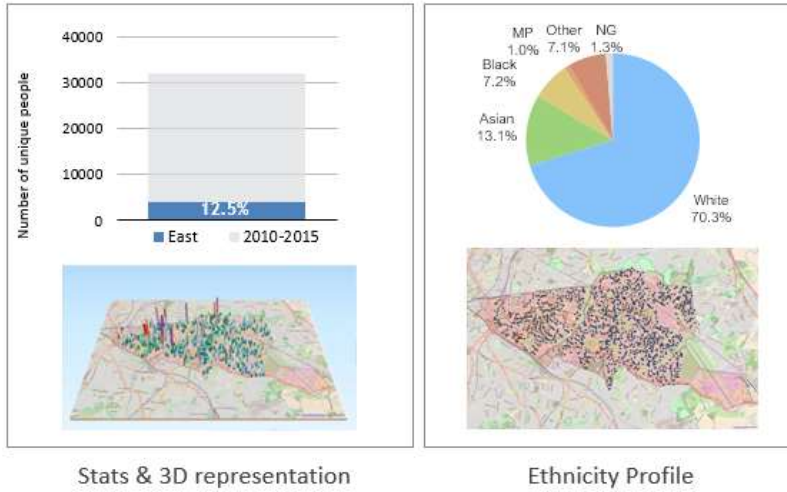


Figure 31: Eastern area

(where do they live, age and ethnicity)

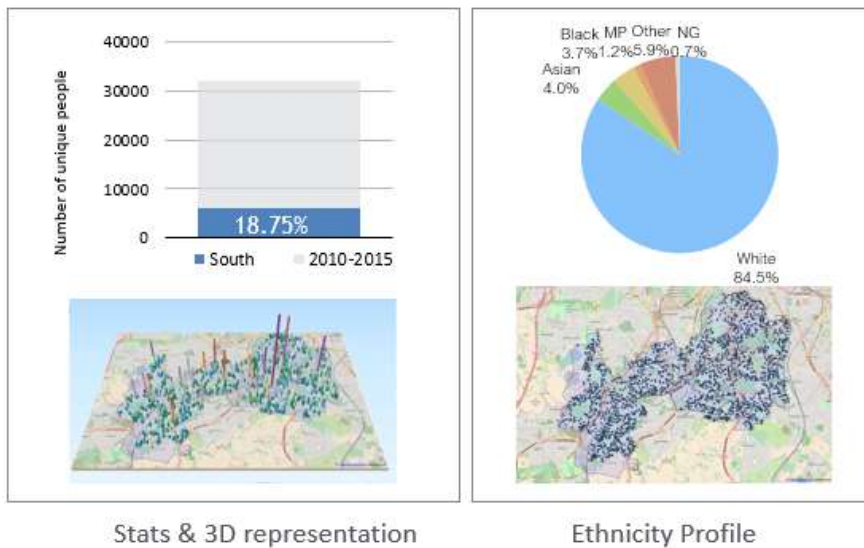


Figure 32: Southern area

4.3 Improving processes

The case studies presented here build on the dataset research through the inclusion of further additional data attributes associated to 'agreements', which denoted the provision of a service to an individual. The additional attributes included data captured from the initial referral to the Council for assessment of need and provided the Council with the initial pieces of personal data that are recorded as part of the social care record for the individual. As such, they begin to develop further the understanding of the data that is captured as part of the wider process, how it is recorded and how it can be used to inform improvements in the process and subsequently, to support better decision making, and make it easier for the Council to plan and monitor performance more effectively.

The Council Business Plan 2016¹⁶⁹ provided the context for this research, identifying: (i) seamless health and social care provision, so people can get the service they require or the

correct information and advice in one place, with people who need services able to access these irrespective of who the provider is; (ii) citizens having greater control and independence and making informed choices about care providers, support they require and place of delivery, with all citizens with an eligible care need having access to either a Direct Payment or individual budget. Table 11 sets out the respective cost of services for older adults during 2014 – 15.

Category	Cost
Older peoples' services	£89.7 million
Adults with learning disabilities	£68.4 million
Adults with physical disabilities	£20.7 million
Older adult services	£15.2 million
Adults with mental health needs	£8.8 million

Table 9: Total adult social care net expenditure of 2014–15

The results presented here are for assessments for April 2013 to December 2016, inclusive. As the data spanned the period pre and post the implementation of the Care Act, we noted that (i) there was a change in eligibility criteria and assessment practice and (ii) systems and processes experienced a period of change at that time, in preparation for and during the adoption of Care Act changes. The data subsample included 69,147 distinct users, registered for more than 238,000 assessments, and comprising eight major assessment sub-processes.

For agreements, open and closed data for the same period were used to study the progress of individuals. The data included 29,385 distinct people and more than 90,600 service agreement records. Each service agreement consists of twelve records as set out in Table 12.

Record	Description	Assessment	Agreement
ASM_ID	Assessment ID	X	-
PERID	Person ID	X	X
DOB	Date of birth	X	X
Agreement start	Start date of the agreement	-	X
Agreement end	End date of the agreement	-	X

Assessment start	Start date of the assessment	X	-
Assessment end	End date of the assessment	X	-
Service	Alphanumeric coding of the service	-	X
Service description	Description of the service	-	X
Element	Alphanumeric coding of the element	-	X
Element description	Description of the element	-	X
QSA.Desc	Quality standard assessment process description	X	-
QSA.Group	Quality standard assessment process group	X	-
Assessment reason	Reason of taking assessment	X	-
Form_Outcome	Outcome of assessment form	X	-
Service Team	Corresponding assessment team	X	-
Postcode	Full postcode (unit level)	X	X
Gender	None	X	X
Ethnicity	Ethnic classification	X	X
Client group	Disability status	X	X
Ward	None	X	-
Constituencies	None	X	-

Table 10: The service assessment and agreement records used in this study

The data were further filtered and focused on four core sub-processes: contact assessment (CA), assessment (AS), support planning (SP) and service agreement (SG) (see Table 13).

Process	Number of records	Number of individuals
Contact assessment	124,575	56,701
Assessment	37,581	26,632
Support plan	42,593	23,936
Service agreement	94,400	29,385

Table 11: Number of service records and unique individuals of the sub-process in the assessment process

For the purposes of this research, we grouped the forty-two different outcomes into five categories (see Table 14).

Example	Number of outcomes	Number of teams	Category
Close, no further services, etc.	13		Close
Closure—safeguarding only, equipment only, etc.	7		Qualified Closure
Further assessment, create support plan, etc.	15		Proceed
Await authorisation, new event, other, etc.	5	-	Unknown

Closed at adult's request and closure—declined assessments	2	-	Did Not Take Place
AD Erdington, AD Selly Oak, etc.	-	10	Adults (Location)
LD North, LD Transitions, etc.		6	Learning Disability
MH Central, MH Homeless, etc		10	Mental Health
City Hospital, Solihull Hospital, etc.		8	Hospital Settings
OA Northfield, OA Reviews, etc.		13	Older Adults (Location)
PD Activ8, PD/LD Complex Reviews, etc.		5	Physical Disability
ACAP, HI Rehab, Rapid Response, etc.		33	Others

Table 12: The category of form of outcome and corresponding team

4.3.1 Case study 5: Qualitative exploration of data flow in the assessment process

The first of the case studies within this theme provided a qualitative exploration of data flow within and between the phases of assessment with the analysis of the four core sub-processes and that the focus was on the quality and flow of data, not why it was as such. The study concentrated on three linked processes: CA to AS, AS to SP and SP to AG. To improve our understanding of each sub-process, a matrix was generated to examine the flow of data through these linked processes. Findings highlighted that as many as a quarter of individual records appeared in a stage but not the proceeding stage. For example, 8,350 recipients received agreements but did not have a corresponding SP.

The case study identified the percentage of cases that did not flow naturally through the assessment process to agreement, highlighting potential issues with data recording which could impact on decision making processes or future service delivery plans.

	CA	AS	SP	AG
CA	–	–	–	–
AS	3,967 (6.54%)	–	–	–
SP	–	8,930 (25.11%)	–	–
AG	–	–	8,350 (25.86%)	–

Table 13: Matrix of number of people who appear in a stage but not the proceeding stage

4.3.2 Case study 6: Identifying anomalies in the assessment process

In this case study, we examined 27,238 unique individuals whose information was only present in CA and investigated the outcomes associated with each. This, as with Case study 5, demonstrated a significant number of cases where recorded data do not flow sequentially between and through stages. The CA sub-process represented the start of the workflow and should therefore include a decision to proceed or not as part of the assessment process. It is assumed therefore that some client information would only appear in this stage and not subsequent stages.

Two key findings were identified. Firstly, that sixty-four per cent of people receive a single assessment. If the process is followed correctly, then, for each single assessment, there should be a corresponding record reflecting one of the possible 'closed' categories set out in Table 14. However, the data revealed that, instead of closure (CL), 53 per cent of records highlight the need for further assessment (FA), which indicate that the record should be held for revision or progressed to AS for additional support.

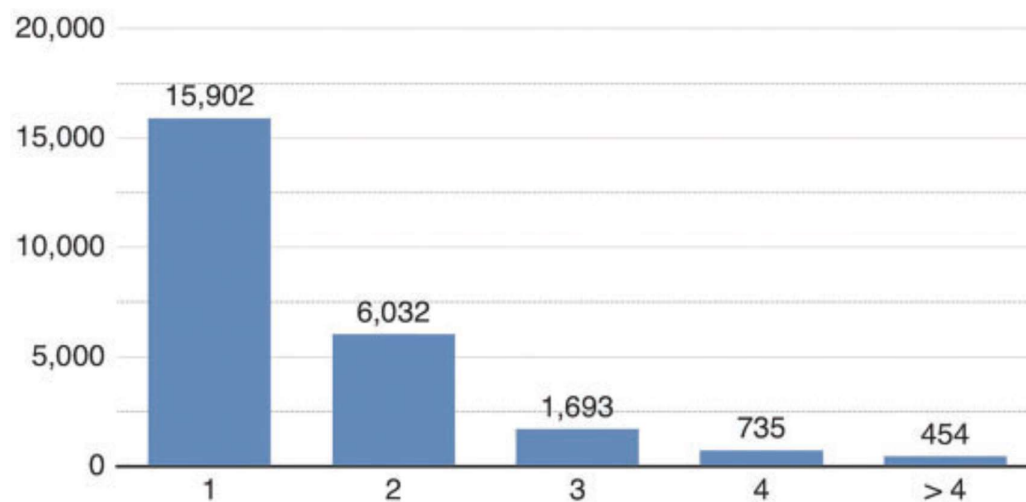


Figure 33: The number of the frequency of assessment taken by individuals who only appear in CA

The second finding related to the length of time it took for an assessment to be carried out. These variables can be used to calculate the length of assessment in days (see Figure 34). The graph illustrates a high correlation between frequency of start and end dates; 94 per cent of individuals end their assessment within the first month and almost 58.5 per cent leave the process within a week.

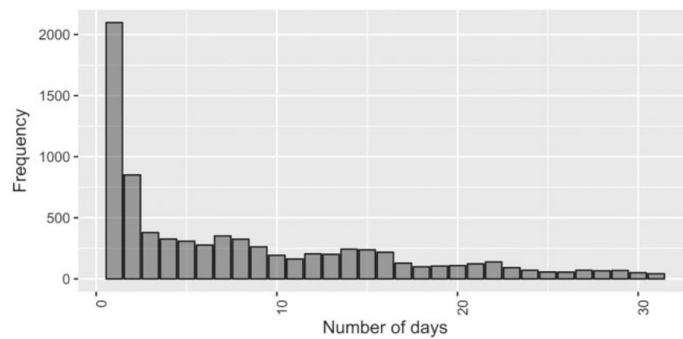


Figure 34: Frequency of length of provision of CA people who receive one assessment

4.3.3 Case study 7: Characteristics of completed stages

This final case study investigated the progress of service users through the sub-processes and the outcomes of each stage. The data showed that 11,575 people (16.42 per cent) of a total of 70,474 successfully progressed through the assessment process to receive a service. However, this only accounted for 40.57 per cent of individuals at the AG stage.

Our analysis mapped the outcomes and corresponding assessment teams for all registered people in the assessment process (Table 13); Figure 35 displayed these results as a matrix, matching outcome groups (rows) to assessment teams (columns), using the supporting data set out in Table 14 that determine the number of subgroups in each category.

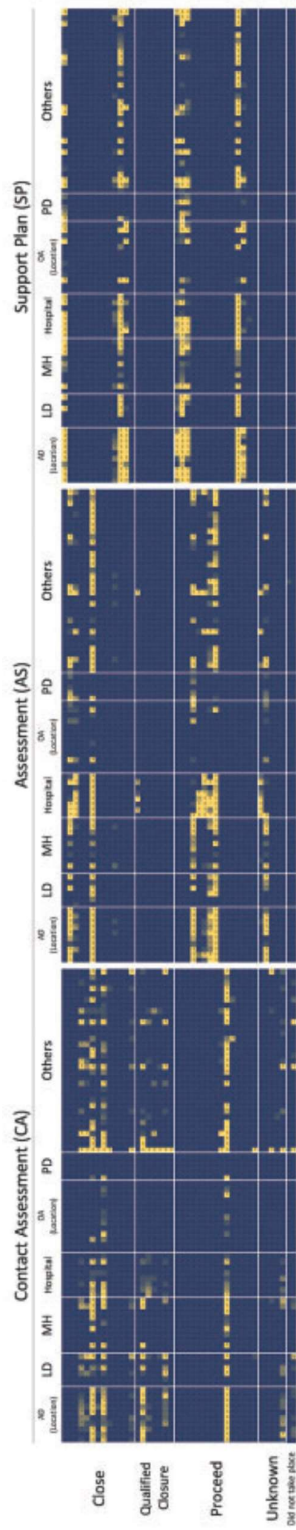


Figure 35: Matrix of form of outcomes (rows) against the corresponding teams (columns) in assessment process

4.4 Increasing service quality

The final set of analysis conducted using this dataset involved bringing together the data and the outputs from the earlier case studies and applying them to budget saving proposals presented by BCC as part of its budget setting processes in 2016, using the Council's Business Plan and Budget 2016+¹⁷⁰ as the reference document.

The Council's 2016 budget plan sets out six themes as follows: (1) Preventing family breakdown; (2) Maximising the independence of adults; (3) Sustainable neighbourhoods; (4) Economic growth and jobs; (5) The changing workforce; and (6) Council-wide.

The specific case studies identified for consideration in this research were taken from the Maximising the Independence of Adults (MIA) theme, which included current service delivery to children and adults. The theme aims to support both younger and older adults to live as independently as possible, connecting adults with local community services and providing services at the right time. There were 16 MIA areas, but our analysis focused on three: (i) MIA3: Promoting independent travel and reducing reliance on Council funded transport underpinned by clear policy; (ii) MIA5: Internal Care Services – Younger adults day care and, (iii) MIA17: Internal Care Review - Home care enablement. These three themes were chosen as (a) the Council proposed to implement a high proportion of cost saving in relation to these MIAs (see Table 16), and (b) there was good compatibility between the themes and the attributes and service elements within the dataset provided. This reflected the underlying theme in the research to focus on children's and adults social care data and services delivered to this cohort.

MIA's	Net Spend in 2015/16	Saving in 2016/17	Saving in 2017/18	Saving in 2018/19	Saving in 2019/20	Cost Saving Percentage
MIA3	£15.711	£2.463	£2.634	£2.634	£2.854	16.84%
MIA5	£7.693	£0.702	£1.113	£1.288	£1.288	14.26%
MIA17	£13.707	£1.5	£1.5	£1.5	£3.7	14.96%

Table 14: Net spending, proposed cost saving of MIA3, MIA5 and MIA17 (in £million) and its percentage cost saving

4.4.1 Case Study 8 - MIA3: Promote Independent Travel and Reduce Reliance on Council

Funded Transport

The Council's stated aim for this theme proposed to work with families to create travel solutions that decreased the number of council-run transport to school services. Therefore, we were interested in analysing the change in demand in related services over time and the potential impact of this change on Council spending and the number of service users.

To illustrate the demand and spending on transport services, we use temporal analysis to interpret the data across the six-year period, see Figure 36. The analysis reveals the number of service records (the grey bar chart), the number of recipients (the black trend line) and the total cost of the services to the Council (the blue trend line); each gradually decreases over time. Total number of service records (second column), service users (fourth column), and weekly cost (sixth column) represent the amount of services, service recipients, and the aggregated weekly costs that related to this MIA per year with a proportion percentage.

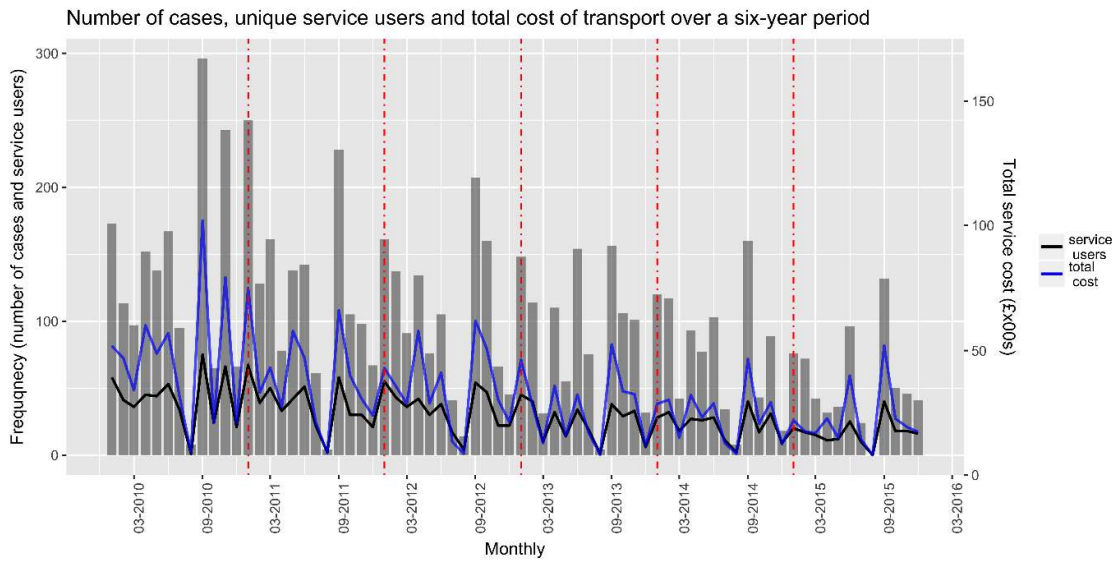


Figure 36: Number of records, service users and total cost of transport services over a six-year period

4.4.2 Case Study 9 - MIA5: Internal Care Services - Younger Adults Day Care

The Council's stated aim for this theme proposed to reorganise its internally provided services so that people could choose to purchase these services, or different community-based services, thus allowing recipients greater control of the services for their assessed needs. Analysis presented here features levels of internal and external provision during 2010 and 2015, the service user types, as well as the aggregate costs and the geographical dispersal of the services. We were interested in understanding what impact service demand over a given period would have on the viability of the savings proposals for this theme.

The case study focused on the provision of internal care versus external care and sought to identify change in demand over time. The internal services delivered by the Council in 2016 included, enablement/home care, extra care, internal day centres for older adults, internal day centres for younger adults, residential respite services and residential care centres.

Similar external services are operated by private and 'not for profit' organisations across Birmingham.

The aggregated proportion of internal and external services provided was 31:69 over the six-year period in question. Using the data, we analysed the percentage of the two service types at the district postcode level, see Figure 37.

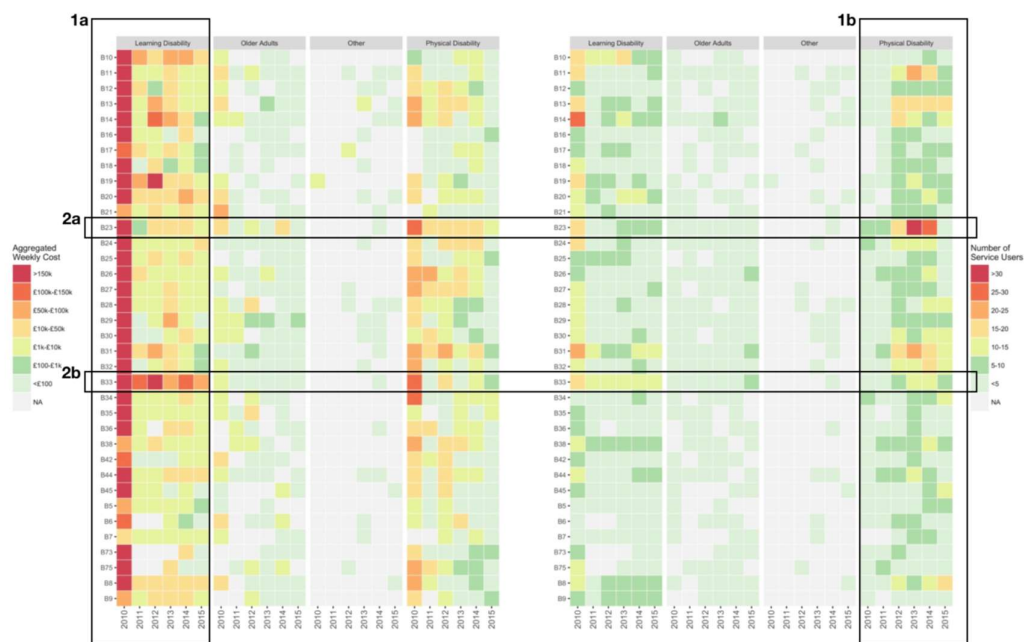


Figure 37: Spatial-temporal heat map matrix by aggregated cost, number of service users and postcode

We highlighted two key findings that emerge from this analysis. Firstly, the aggregated cost of Learning Disability services in 2010 alone accounts for £11.5 million (more than 60 per cent of the total spend over all years).

The second key finding related to postcode areas B23 and B33, which showed patterns of costs and service user numbers that were significantly different from the remaining postcode

areas. In B23, costs of Physical Disability services decrease, but with higher numbers of service users being supported before a substantial drop in the final year, see box 2a. In postcode area B33, we see a consistent pattern of high spend after an initial decrease, then a stable number of service users being supported, see box 2b. To better understand these anomalous patterns, further data are needed at the postcode level to identify any specific local issues that may impact the findings.

4.4.3 Case Study 10 - MIA17: Internal Care Review - Home Care Enablement

The Council's stated aim for this theme proposed to operate and develop future enablement services closely aligned with NHS partners and find alternative ways to deliver the services through different providers. We were interested in studying consistency and performance of existing provision and how this could affect future service deployment.

This case study focuses on the six-week threshold and the total number of people receiving the service. The study began by comparing the number of individuals who received the following three service elements: LDIHSENB - Learning Disability Enablement; OAIHSENB - Older Adults Enablement; PDIHSENB - Physical Disability Enablement, over the six-year period, see Figure 38.

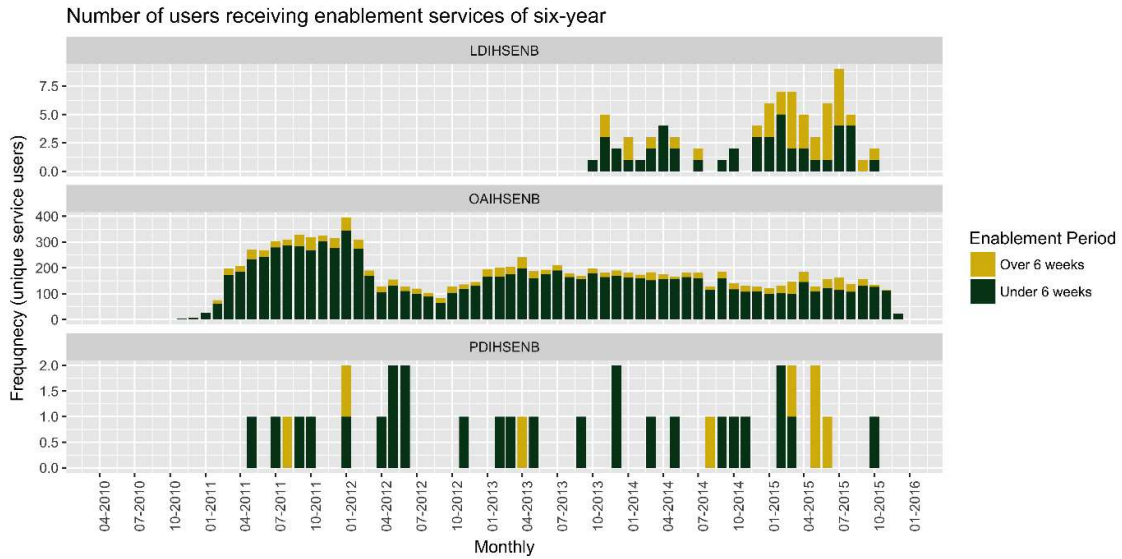


Figure 38: Frequency graphs of the three enablement service elements received by service users over six-year period

We also examined the geographical dispersal of aggregated and normalised unique enablement service users per thousand of the population, including those that have been in receipt of services for more than six weeks, see Figure 39.

This study highlights that (i) approximately 1 in 5 service users receive free care beyond the six-week window and this may influence discussions with external partners on the future delivery of these services and (ii) some postcode regions are likely to exceed this 20 per cent and some are not.

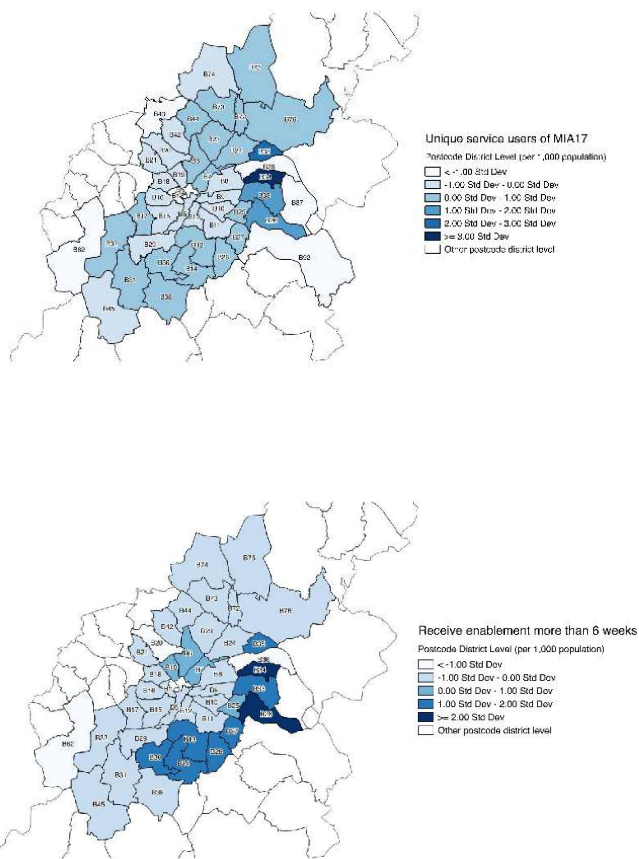


Figure 39: Geographical mapping of normalised frequency of the enablement service elements and users

4.4 Discussion

The research outcomes set out in the chapter provide an analysis of the steps taken to understand, access and utilise social care data held by Birmingham City Council and apply it to different aspects of Council data and insight strategies to demonstrate how a dataset from a single source system can be used to achieve the respective aims of the strategy.

- a) Providing reliable, timely position reports, research, analysis, and data on critical issues to drive delivery of the Council’s priorities and manage performance.

The first four case studies presented in this chapter were selected to demonstrate how research and insight can be obtained from data held within local authority systems, through a targeted evaluation of the data alongside historical records of service management frameworks and key Council priorities and objectives.

Several attributes of the data, including anonymised user identifiers, commissioning dates, approximate location and service costs are critical to understanding the provisioning of social care services and the trends and demands that these services are subject to over time. The primary purpose of data collection within the CareFirst system is the delivery of services and the management of caseloads, as opposed to supporting analysis and research, and making use of the data beyond its original purpose is challenging. However, as this research shows, with the support of suitable anonymisation and data analytic techniques, data are assets that local authorities may increasingly look towards to support budget reduction challenges whilst supporting and maintaining levels of service to a diverse population.

As each of the four case studies highlights, our analysis allows past provisioning of services to be better understood, trends in the delivery of services to be identified and, future demand to be forecasted.

Each case study has a different focus, demonstrating varied capability. Case study 1 investigates the impact on older adult care following transitioning from one contractual framework to another, identifying those postcodes which may have been impacted by this transition. Case study 2 considers services provided to disabled children, a small pool of

recipients aged between 5 and 18. Respite services are costly, and we show how it is possible to model the likely increase in these costs in future years. Case study 3 explores how CareFirst data can be used to understand the relationship between the provision of services provided by an external provider and those provided directly by the Council. This work will also support the Council in its aim to save around £9 million on Home Care Enablement between now and 2020.

Case study 4 analyses service delivery across three city regions through the application of spatio-temporal analysis, which provide an overall picture of where council spending on these services has taken place, and the age groups of registered users. We identify the distribution of services over time and, in our example, the uptake of these services by people who are aged 11 to 25 across the city. Care services (for those aged below 18) are notable, as they dominated all other groups in the cost of social care services. The analysis of the three city regions demonstrated that in the southern part of the city, service payment per year was approximately 25% more than in the northern and eastern parts of Birmingham. Despite a higher number of agreement records, services for older adults (age over 25) were less expensive than those of the younger age group. The three-dimensional dispersal map emphasised the domination of clients aged 11-25 in the number of agreements received from different locations across the three city regions.

b) Improving processes, and providing tools and information, to support better decision making, and make it easier to plan and monitor performance more effectively.

The next set of case studies related to research that sought to examine the assessment process for adult social care in Birmingham, including the creation and collection of data, the potential outcomes for service recipients at each stage of the process and identifying possible areas for consideration that may support improvements in recording practice, delivery of services and, in the context of the budget cuts facing the local authority, better understanding of the needs of service users.

The assessment process shows the complexity of the data flow for a service user from referral to agreement and, as a consequence, the quality and accuracy of the records held by the Council for an individual, which has a particular resonance with the data protection principle requiring accuracy,¹⁷¹ or correction in the case of inaccuracy, for the purposes for which they are processed.

There are a range of possible outcomes from this process and these are impacted by the quality of the data available at each stage, as highlighted by the existence of an excluded list that contains details of those service users for whom there are insufficient data for the council to take any meaningful action. Case studies 5, 6 and 7 highlighted a range of issues facing the council in managing and delivering services whilst attempting to meet difficult savings targets as part of the budget setting processes; the case studies also indicate that these challenges are compounded by aspects of data collection and management.

The fifth case study demonstrated that, within the data, a significant number of records appear in sub-stages of the process but have no connection to other sub-stages. This highlighted that not all cases follow the predefined operational workflow and, whilst the

numbers are relatively low in comparison to the whole data-set, these records present a risk to the service users in that it is unclear how the assessments are completed outside of the recognised process. This has a potential impact both in terms of the management and recording of personal data within social care records and in meeting social care needs.

The case study shows a possible fragmented process of co-operation and communication of departments along the sub-processes, and that practitioners may, in a significant number of cases, be using workarounds to data input. In the context of individuals wishing to access their records, in accordance with their rights of access¹⁷² under data protection law, this potentially puts the Council at risk of non-compliance with its legislative obligations as well as denying the individual access to an accurate and up to date record of their personal data.

The sixth study investigated the extent to which records are complete at any sub-stage in the process. The data again highlight a significant proportion of the records as incomplete and yet no further action is recorded to have been taken. We also identify anomalies with regards to the higher proportion of FAs against CL. Three-quarters of all wards in Birmingham display a higher proportion of FA to CL outcomes by the end of the first sub-stage of the process. Without further investigation, it is difficult to understand the rationale behind the absence of the data as well as the fragmented process. However, its potential impact upon both the service users and the council could be significant. For the Council this is likely to impact on their ability to fully understand the demand that there is for services or that individuals in need of services are not having their needs met and thereby increasing their vulnerability and risks to their well-being. From the perspective of the individual, this again reflects poor record

keeping in respect of their personal data and has impact upon their legal rights to accuracy of their data and accessing data held by the Council when it is incomplete.

The seventh case study in this sequence considers the frequency of service use. This can be crucial for future planning and commissioning of services, as well as for the development of the social care tendering process and for third-party providers, in that this provides some certainty of the profile of service users and their needs. This study also highlighted the difficulty of future budget planning for the local authority.

This part of the research has explored issues associated with using data held within a social care system to assess the quality and accuracy of that data against the assessment process for which it has been recorded. The research uses data-analytic techniques to examine the flow of information from referral through the assessment process and the resulting service provision between 2013 and 2016. It further identifies the decision-making points throughout the process, to understand and analyse the service users' data and highlight potential deficiencies in the data or the subsequent recording of information because of actions taken. These three case studies are presented to illustrate key findings, highlighting the complexity of social care services, the fragmentation of the processes and the discontinuity of information flow within the system. The issues identified will help isolate areas for service improvement and, as a result, potential resource savings as well as improved record keeping and greater accuracy for individuals to understand how their care needs have been assessed.

There are also potential implications arising from this analysis in relation to records management and recording practice within the Council and, as a consequence, the ability for individuals to access their social care records under data protection legislation and receiving a response that reflects the accuracy of the interaction with the Council and for the Council to demonstrate its compliance with its legal obligations under the same legislation. It also highlights issues with the management of service users' needs and the potential issues in meeting future demands for these services if it is unclear whether individuals have had their needs met whilst going through the assessment process.

- c) Increasing service quality, e.g. speed and accuracy of real-time information, to enable better control and more efficient resource allocation, to deal with issues.

The findings from the final set of case study examples suggest that integrating data analytics with social care data held by BCC are possible, but complex. Case studies 8, 9 and 10 considered how the information can be extracted, analysed, and interpreted to support the assessment of the viability of budget saving proposals considering the financial challenges faced by the local authority. Three case studies are selected to demonstrate how insight can be obtained from the data, through a targeted evaluation of the data alongside historical records of service management frameworks and key council priorities and objectives. Record attributes, including user identifiers, commissioning dates, location details and service costs, are critical to understanding the provisioning of social care services and demands that these services are subjected to over time. Each case study has a different focus, demonstrating varied analytical capability.

Case study 8 highlights the provision of transport services, supporting a child travelling with guardians or on their own. The total cost of these service elements decreases over the six years of the investigation. The case study shows that decreasing these costs further, as is the Council's aim, will require a reduction of over 16 per cent in both service demand and expenditure if the Council wishes to achieve its target by 2019/20. Our analysis shows that this will require almost 1,000 fewer service users than current levels of provision.

The ninth case study analyses internal care service provision. In the context of proposed savings through externalising services, the study provides two supporting analyses: (i) geographical provision of services with aggregated cost and (ii) service user types across different regions. The study highlights an increase in the number of postcodes that provide a higher proportion of internal care services than external care services. However, this increase in demand only occurs in specific groups of recipients. The results show that number of service users has no relation to the total spending at the postcode level. Moreover, the study highlights the impact of changes on service users receiving Learning Disability services and the importance of this user group as part of any future service reorganisation.

The tenth and final case study highlights the demand on enablement services beyond the six consecutive weeks threshold. Although the service is most common for older adults, learning disability enablement recipients are most likely to require more than six weeks of enablement support. This study seeks to discover the characteristics of the areas and services that are most likely to exceed the six-week threshold. The case study tells us that the value of enablement services provided beyond the stated policy threshold equates to almost £800,000 a year and represents over 50 per cent of the proposed savings target. The geographical

differences observed will also impact on how proposed changes to the six-week threshold are delivered.

This research is complex in that it uses several different analytical methods, combining spatial temporal techniques, predictive analyses, and domain knowledge of local government. All case studies are only possible because of the individual-level data retained at the Council. It is also important to acknowledge that the techniques that we apply can help clarify the rationale behind existing procedures utilised by the authority and as a result indicate areas for further analysis. As the case studies highlight, our research allows past service provisioning to be better understood, trends in the delivery of services to be identified and, future demand to be forecasted.

There were several other MIA themes and over 80 different budget saving proposals within the Council's budget plan 2016. It is equally possible to apply these analytic techniques to these proposals, particularly where they include service user numbers, service types and descriptions, location data, and date and time parameters. Whilst there are risks associated with the use of administrative data, it is recognised that if appropriately utilised the data can provide evidence in support of budget setting and social care service provisioning. Such approaches can also support decision-making, initiating new policies and improving existing service support to current recipients.

4.15 Conclusion

This chapter has outlined the results of specific pieces of research conducted during this academic study. It sets out the challenges, risks and issues and analytical capability

surrounding the re-use of social care data held by a public authority. The issues considered in the case studies, from analysing process flows, data recording and record keeping to assessing the viability of budget consultation proposals are specifically chosen to showcase the breadth of the coverage of the re-use of this data and how these in turn support the Council's ambition to use data for evidence and insight purposes to achieve its strategic aims. The case study examples show how data analytic capability can be utilised to develop the capacity within an organisation and achieve the provision of reliable research, analysis and data on critical issues, improve processes, and providing tools and information, to support better decision making, making it easier to plan and monitor performance more effectively and increase service quality to enable better control and more efficient resource allocation.

It is the re-use of personal data attributes under the research provisions of UK information legislation that enables this type of analysis using data analytic techniques set out in the case study examples. Understanding the construct of the wide range of data elements that are associated with an individual personal data record, created during the provision of social care services, provide the basis to support the stated research outcomes.

Being able to retain and use the unique identifier for each recorded individual is critical for the analysis and the application of the data in the case studies. We highlight the details of the individual level data attributes that reflect the type and nature of the personal data within the scope of the research. We then consider how the volume of data is then further broken down, using the personal identifier as the foundational piece of data, to identify the number of unique individuals, the number of records and the status of the associated data through the various stages of the assessment and outcome stages of the adult social care process. As

a result of the application of the research provisions to the data, the research can highlight different aspects of the personal data created as the individual navigates their way through the social care assessment process and subsequent service delivery.

By aggregating the data of multiple service users in this way and applying it in the manner set out in the case study examples we are able to present the findings as set out and use these to inform changes and improvements in the process that will benefit future service users through a clarity of the recorded interactions, a potential reduction in unclear recorded outcomes and a clearer accurate record for the service user of their interaction with the Council in respect of meeting their social care needs. Through this process we can reflect that the use of the personal data attributes is compatible with the original purpose for which it is obtained, in that it relates to the wider social care service and that the re-use of the analysis will not have an direct adverse impact upon the individuals whose data is used within the research dataset.

Similarly, we can apply these practices of the re-use of the data to Council proposals for changes to service provision as part of the budget consultation process. In this instance, the personal data attributes utilised in the case studies allow a level of analysis and granularity to be applied to historic service patterns and future budget savings proposals that can inform and influence policy discussions that can have an impact upon future service users or those potentially no longer in the scope of the assessed service. Each of the case studies in this research, summarised in this chapter, highlight the capability of data analytics techniques that can be used to connect the specific types of service provision and the numbers of recorded users of the services in order to provide in depth analysis of the potential future state of the

impact upon service users of proposed changes to services. Additionally, it provides a different approach and perspective to the budget consultation process and subsequent analysis of the viability of the savings proposals that has not previously been utilised.

The next chapter introduces the final piece of research considered during this study. It builds on the discussion set out in Chapter 3 that outlined the process undertaken to access children's social care data for the purposes of research. Chapter 5 covers the analysis of the data obtained and builds on the concepts introduced during the period of research to cover issues around process flows, data recording and personal data records.

Chapter 5 A study of data recording in children's social care

5.1 Introduction

As set out in Chapter 3, an element of this research focussed on obtaining information related to children's social care and this Chapter discusses the analysis carried out on the data.

Good case recording is an important feature within children's social care work. It can help demonstrate the accountability of staff working in this field to those who are supported within the service. It can help focus the work of staff and it supports effective partnerships with service users and carers.

The use of IT systems to support the case recording is now standard practice in many jurisdictions. This research focusses on the elements of data recording within an IT system as part of the management of the social care assessment process.

Data is derived from the social care system in Birmingham, CareFirst, from 2013 to 2016. Findings highlight the changing nature of the recording as a result of organisational or practice changes, the descriptions applied to the recording of assessment and outcome types, the frequency of the use of the recording and the impact of the recording on the rights of individuals in accessing their records and understanding their time in care.

The recording of data within social work systems can be viewed from different perspectives. Firstly, the guidance provided within social work practice as to what constitutes good recording practice. Secondly, research into the information technology systems that support social care recording have highlighted the challenges that the systems bring to the operational

practices within social care. Thirdly, there are the legal requirements that need to be satisfied in respect of the processing of personal data that should inform the manner of the recording as it relates to the individual and their ability to exercise their rights over that data.

5.2 Performance of Children's Social Care in Birmingham

There has been considerable focus on the performance of children's social care in Birmingham for several years. In 2008, the annual performance assessment of children's services judged Birmingham as inadequate at helping children and young people stay safe. A 12-month improvement notice issued and was followed by a further inspection by Ofsted in 2009 that judged that while improvements had been made, further improvements were needed.

In 2014 Birmingham City Council published two reviews conducted into Birmingham children's services. The first was by the Local Government Association (LGA) which was commissioned by the Council. The second was the Le Grand Review which was externally commissioned. Also, in 2014, the Department for Education appointed Lord Norman Warner as commissioner to oversee improvement in children's services in Birmingham.

In May 2016, Birmingham City Council announced its intention, as part of the children's services improvement journey, to explore a trust model and in early 2017, the Council approved the creation of the Birmingham Children's Trust to provide children's social care and related support services (via a commissioned relationship with the Council) under a service delivery contract.

In May 2017, an Ofsted monitoring visit found that children's services were making 'steady progress' and in April 2018, the Birmingham Children's Trust was launched. Most recently, in August 2018 a further Ofsted monitoring visit found that 'there has been some progress since the last inspection of services for children subject to children in need or child protection plans.'

Approximately 1800 children are in care and 1 in 3 children live in poverty and there is a gap in life expectancy between the wealthiest and poorest wards. English is not the first language for 42% of school children.

5.3 Case recording practice and guidance

There is a wide range of advice, guidance and regulations that govern the case recording within children's social care from multiple different sources.

Successive pieces of UK legislation have also stipulated what must be kept as part of a child's record.^{173 174 175 176 177 178} Furthermore, guidance outlining how social workers and other professionals should support children in care and care leavers has been published by the Department for Education. Statutory guidance published in 2017 and 2018 focus on supporting the education of children in care and previously looked-after children, and how extending personal advisers up to 25 for care leavers should be implemented in line with the Children and Social Work Act 2017.¹⁷⁹

Further examples of training and support in improving recording practice can be found in an interactive training pack commissioned by the Department of Education and Skills, to support

good practice in recording.¹⁸⁰ Local authorities, which have statutory responsibility for the provision of children's social services, produce and publish their own policy documents which include the principles and values of the organisations that set the standards that need to be met.¹⁸¹ Organisations operating in the social care field such as the Social Care Institute for Excellence (SCIE) also provide a wealth of advice and guidance on the nature of and need for good record keeping.¹⁸²

Recording is also part of the code of practice for social services workers published by the Scottish Social Services Council (SSSC)¹⁸³. The code sets the expectations for the conduct of social service workers and the standards of conduct that the public can expect from social service workers. Specifically, in respect of recording the code states:

'As a social service worker, you must be accountable for the quality of your work and take responsibility for maintaining and improving your knowledge and skills.'

The code of practice also recognises the experience of front line staff in relation to recording, noting that despite recording being a key part of social work practice, it is often seen as a 'tedious chore' getting in the way of practice rather than enhancing and enabling it, with practitioners often expressing the view that actually 'doing the work' is more important than 'writing it down.' Other issues regarding recording included:

- the time spent on servicing the IT system
- lack of training in recording;
- variable standards in recording practice;
- some difficulties in reconciling the readership of files

- the view that recording had become a 'tick box' form filling task in recent years.

The challenges that the health and social care sector face when looking to undertake large-scale digital change, as part of a transformational agenda, highlight issues with records, record keeping and the capability to share records across organisations.¹⁸⁴

Social care records often fail to capture the complexity of what social workers do and result from and cause much of the bureaucratic maze that practitioners often struggle with.¹⁸⁵

There are counter arguments that the challenge with records and record keeping has not increased record-keeping in social work, rather it is the way it is done and that, by breaking down and unpacking this work, it is possible to break the activity down into components, which individually, would demonstrate the value of good recording practice.¹⁸⁶

Recognition also needs to be given to the number of different purposes that social work records need to serve. Different professionals can be responsible at different times for composing each service user's records and this adds to the complexity of the task.¹⁸⁷ Social workers, when asked what they dislike about their job, are likely to have 'too much paperwork' high on their list. Recording cases and filling out forms can feel like an unnecessary layer of bureaucracy, taking time away from seeing service users.

The significance and importance of record keeping has also featured in every inquiry into major instances of failure to protect a child, such as Lord Laming's report into the death of 7-year-old Victoria Climbié, that pointed to recording defects as a major factor.¹⁸⁸ A recent

research project from the UCL MIRRA: Memory – Identity – Rights in Records – Access (MIRRA) adopted a ‘recordkeeping perspective’, which sought to deepen the understanding of both information rights and responsibilities in care records by considering the effects of how they are thought of, created, used and managed throughout their existence from multiple perspectives. This research establishes the background and validity of this approach, outlining and justifying the recordkeeping perspective and its potential for informing social work practice.¹⁸⁹

Government guidance on the need for good case recording highlights the importance of recording to demonstrate the accountability of staff working in looked after children’s services to those who use those services.

“It ensures there is a documented account of the responsible authority’s involvement with individual service users, families and carers and assists with continuity when workers are unavailable or change.”¹⁹⁰

A responsible authority is required to establish and maintain the child’s written case record. This is an individual case record for each child looked after by them. Records are the basis for a clear and common understanding of the plan for the child, the arrangements made, the agreements reached, the decisions taken and the reasons for them. A case record can include a wide range of information such as:

- documents created as part of the assessment process;
- any court order relating to the child such as the care order or order relating to contact;
- details of arrangements for contact;

- copies of reports provided during court proceedings such as guardian's reports and specialist assessments;
- additional information about educational progress;
- records of visits; and
- other correspondence which relates to the child.

The responsible authority's records will be an important source of information for the child who is looked after, providing details of when and why important decisions in the child's life were made. It is expected that the record be maintained in such a way that it is easy to trace the process of decision-making.

5.4 Access and confidentiality

The Children's Act 1989 requires authorities to give access to records to persons duly authorised by the Secretary of State and to guardians appointed by the court with access to records by the local commissioner provided for in the Local Government Act 1974. Additionally, the General Data Protection Regulation¹⁹¹ (GDPR) and Data Protection Act 2018 (DPA) give individuals the rights of access to certain information about themselves.

The DPA applies to all records, including social work records. The Act provides for certain information (such as adoption records) to be exempted in prescribed circumstances from the right of access. The DPA applies to both paper/manual records and records held electronically and organisations holding these records should ensure that their electronic systems for recording personal data are able to meet the legal requirements to enable an individual to exercise their legal rights to access their information. The GDPR requires information

provided to an individual to be concise, transparent, intelligible, and easily in an accessible form, using clear and plain language. This will be particularly important where the information is addressed to a child.¹⁹²

The recording of information about health and social care provision in relevant IT systems has also been the subject of considerable research. Whether this relates to the efforts to improve data collection on the child welfare population, with emphasis on measuring outcomes for children at risk of abuse or neglect and at risk of placement, as well as children in foster care, kinship care, and adoption¹⁹³, the need to ensure that the collection of data must also be used to improve care¹⁹⁴, or the concern that the Information System (IS) is being used as a management tool rather than for case management to support practices can distort the approaches to data collection¹⁹⁵ and this can influence the type, manner and recording of information.

In other industries, the use of predictive analytics has enabled substantial efficiencies, ranging from improving outcomes of sports teams with low budgets to anticipating what consumers wish to purchase. Sometimes such analyses can be done with traditional approaches, but increasingly they involve the use of large and disparate datasets, which moves into the territory of “big data”. However, the potential for improving health and healthcare through bringing together multiple sources of data are great. The challenges are also considerable, ranging from supporting the costs of doing this, to ensuring the privacy of data and getting individuals to contribute their data.¹⁹⁶

There are estimates that the amount of time spent by a social worker on servicing IS can be up to 80%.¹⁹⁷ Changes to the design of IS need to be monitored and critically evaluated in terms of their effect of social work and engaging social workers in the design of IS so that they have a constructive contribution should be considered.

Further research by Gillingham has asserted that accountability is a key element of IS design. It is noted that the rise in the importance of the accountability has been well documented and that, “current forms of IS are heavily implicated of how accountability has come to be operationalised in human services organisations”.¹⁹⁸ Gillingham further asserts that it is rare for IT designers to substantially appreciate the working conditions of the people who will be using the systems that they design¹⁹⁹ and that information systems also contain structures that are socially constructed which represent ‘world views’ and ideas of how things should be. There are other issues regarding the way recording of information amounts to recoding of the information to meet the requirements of the organisation’s schema. He concludes that despite evidence of considerable investments in information systems, the desire to improve and enhance practice has not been effective.

A critique of current forms of information is well established and its implementation can have unintended and adverse consequences in further research by Gillingham. The paper²⁰⁰ identifies 3 potential pitfalls. First, information systems can create efficiency within an organisation but just because the system may contain functionality to engage with a wide range of tasks, it does not necessarily mean that it should be used to do so. In the context of the collection and recording of personal data, this relates to the DPA principle of data minimisation, which states that the personal data being processed is sufficient to properly

fulfil the stated purpose, has a relevant link to that purpose and limited to what is necessary. Second, an information system can record many types of information in a variety of formats and consideration again should be given to the necessity to what formats are used and for what purpose. Third, expectations should be realistic, making sure they are not used to solve organisational problems.

5.5 Children’s social care

A child and their family can receive support from a range of sources because of interaction with a children’s social care function which would result in the exchange and recording of information. They are Core Services, Specialist Teams and Provider Services. Within each of these functions there can be several different sub functions that exist to provide types and levels of support for a child. As such, the interaction of each function is reflective in the records and information systems in operation to reflect the service provisions. These sub functions can include:

Core Service	Description
Children’s Information and Advice Support Service (CIASS)	The first point of call for all contacts and services relating to Children, Young People and Families.
Early Help Brokerage	Provides signposting for professionals and families where a child and their family have additional need.
Family Support Teams	Work with families with additional needs that require support and help to improve/change their parenting to enable them to look after each child.
Multi-Agency Safeguarding Hub (MASH)	A multi-agency team which triages contacts and referrals from the public, professionals and CIASS.
Emergency Duty Team	A team that provides an out-of-hour service when a child or family presents to Children’s Services with issues that cannot wait until the next working day and an immediate action is required to assist or protect them.
Assessment and Short-Term Intervention Teams (ASTI)	A team that carry out assessments of need for each child (under S17 and S47 Children Act 1989) and undertake brief solution-focused social work interventions with the child and their family.
Safeguarding Teams	Focus on each child subject to Child Protection or Child in Need Plans, working with families with long term complex needs.
Children in Care Teams (CIC)	Provide support to children in care.

Independent Reviewing Services	Quality assure the care planning and review process for every child in care to ensure Child in Care and Pathway Plans are aspirational and forward-looking.
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Table 15: Core Children's Services Team and purpose

Specialist Teams	Description
Special Educational Needs Assessment and Review (SENAR)	Work with each child and young person with special learning needs (0-25) who needs an Education, Health and Care Plan.
Disabled Children's Social Care (DCSC)	Help disabled children and young people and their family with additional support to live at home and participate in activities.
Virtual School for Children in Care	Supports the education of children in care through personal education plans and use of pupil premium.
No Recourse to Public Funds Team	Supports each child in need whose family has restricted access to public funds.
Unaccompanied Asylum - Seeking Children Team	Supports children who are applying for asylum, are separated from both parents and who do not have an adult in this country to support them.
Homeless Young People Team	Supporting young persons (aged 16-17) in need because of issues with access to accommodation and housing.
Family Group Conference Service	Engages the wider family in open discussion so that they can agree and put in place a sustainable plan to meet the long-term needs of each child.
Contact Services	An area-based service that provides supervised contact for children who are subject to an interim or full care order or placement order.

Table 16: Specialist Children's Services Team and purpose

Provider Services	Description
Foster Care Service	Recruits, trains, supports, and supervises foster carers.
Special Guardianship Support Team	Assesses prospective special guardians and offers advice and support to approved special guardians.
Private Fostering Service	Provides initial assessment of the suitability of private fostering arrangements and subsequent support and advice
Adoption Service	recruits, trains, assesses, and supports prospective adopters, seeks matches for children who need adoptive parents and provides post adoption support to adoptive families. There is also a service for adult adoptees returning to understand their past.
Rights and Participation Service	Provides advocacy for children and young people that are being supported through a Child in Care or Child Protection Plan.
Therapeutic Emotional Support Services	Is an emotional wellbeing and tier two mental health service for children in care, care leavers and those on the edge of care?
Edge of Care Service	Work with children (aged 11+) at high risk of entering care and their families.
Child Protection Service	Organises and chairs Child Protection Conferences.
Local Authority Designated Officer (LADO) Service	Co-ordinates and oversees investigations about staff who work with children, about whom there are allegations of abuse or misconduct.

Specialist Assessment Service	Provides and arranges specialist parenting assessments where approval for this has been given by the Area Resource Panel or ordered by the Family Court. This includes residential, community based and psychological assessments.
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Table 17: Provider Children's Services and purpose

5.6 Children's Social Care data

The data obtained for the purposes of the research covered the 23 attributes set out in Table 20 below and covers the period from April 2013 to 2016. The data is pseudonymised. The Person Identifier is retained so we were able to understand the impact of the recording of information at an individual level.

The dataset contained the records of 63,012 unique individuals with a total of 768,728 records related to these individuals.

Record	Description	Assessment	Agreement
ASM_ID	Assessment Identifier	X	
PERID	Person Identifier	X	X
DOB	Date of birth	X	X
AGREEMENT_START	Start date of the agreement	-	X
AGREEMENT_END	End date of the agreement	-	X
ASSESSMENT_START	Start date of the assessment	X	-
ASSESSMENT_END	End date of the assessment	X	-
SERVICE	Alphanumeric coding of the service	-	X
SERVICE_DESCRIPTION	Description of the service	-	X
ELEMENT	Alphanumeric coding of the element	-	X
ELEMENT_DESCRIPTION	Description of the element	-	X
QSA_DESCRIPTION	Quality Standard Assessment process description	X	-
QSA_GROUP	Quality Standard Assessment process group	X	-
ASSESSMENT_REASON	Reason of taking assessment	X	-
FORM_OUTCOME	Outcome of assessment form	X	-
SERVICE_TEAM	Corresponding assessment team	X	-
SERVICE/ELEMENT_COST	Cost of service/element where available	-	X
POSTCODE	Postcode (unit level)	X	X
GENDER		X	X
ETHNICITY	Ethnic classification	X	X

CLIENT_GROUP	Disability status	X	X
WARD		X	-
CONSTITUENCY		X	-

Table 18: Children’s social care data attributes

From the data and using the Assessment_Reason and Form_Outcome as a means of bringing the data together, a total of 268 different combinations of assessment / outcome descriptions were identified and were used as the basis for the analysis. For example, Table 21 below sets out an Assessment Reason and Form Outcome that can be recorded in the system to reflect an activity.

Assessment Reason	Form Outcome
CICHLTH - Looked After Nurses – Notes	HLTHAS - Health Assessment Completed
CIC_PR1 - C I C Accommodation Request	REQUEST - Accommodation Request Completed

Table 19: Example of Assessment Reason and Form Outcome combinations

5.7 Case Studies

In preparing the data for analysis, some initial data cleansing and pre-processing was necessary, and we used PodtgreSQL to manipulate and extract the relevant data from the whole dataset. The extraction process used the dates of the actual assessments against the outcome provision dates to identify the relevant data. The use of the dates enabled the creation of time-series visualisation and analysis using the time series function that divided the date range into a weekly format. We then plotted the data in a graph using ggplot2 Library in R.

Three case studies developed from the analysis. The focus of the case studies was as follows:

- a) Case Study 1 – Technology Focus: This considered the impact of the data because of the changes within the system for recording ‘reason and outcome’ requirements.
- b) Case Study 2 – Process Focus: This considered the impact of the data on the requirements for social care case recording processes.
- c) Case Study 3 – People Focus: This considered the impact of the data on the records of the individuals receiving assessments.

5.8 Case study 1: Technology

In analysing the data in its entirety, we plotted the 268 combinations of assessment and outcome description using the start and end date for when the respective combinations had been utilised within the IT system in operation.



Figure 40: 268 combinations and assessment and outcome description using the start and end date

Figure 40 highlights the data in a single graph and the number of service users within the dataset whose records will include the respective descriptors.

Whilst the dataset covered the 3 years stated, the QSA descriptions used were in operation prior to and after these dates starting in from 2006 and ending in 2018 (with the vertical lines representing a 3-month period). The graph shows the timeframe for the introduction of the different combination types over the 12-year period and the extent to which different types of assessment and outcome descriptions have been used and then ended over different periods of time within the system to record the social care activity.

The graph also shows the growth of the recording processes over time as they were introduced into the social care recording practice and that the introduction and ending of recording types appears to occur in blocks. Furthermore, the graph shows the number of service users within the dataset in whose records the assessment and outcome are recorded ranging from over 20,000 individuals to less than 100.

The graph also highlights an example of an Assessment Reason and Form Outcome (REF03 – Mash – Referral Form (Dec 14 – May 15) LOGREF – Logged as a Referral) which was in use during 2015 – 2016 and formed part of the records of 15,000 – 20,000 users.

A further, more detailed analysis of the descriptions, based on the extent to which the respective combinations are most frequently used, based on the number of service users records that include the respective combination, highlights this issue in more detail.

Of the 268 combinations available, only 7 are used in the records of 10,000 or more service users with only one of these combinations featuring in the records of 20,000+ users, as shown in Figure 41. Whilst the number of service users with these assessments is high, the analysis shows again, the stop-start nature of the use of the descriptors in use within the system at a given period. Additionally, there is a connection between 4 of the assessment outcome types with related to logging of a referral form, with a change in the assessment description to include a reference to MASH incorporated into a new description resulting in a new recording type.

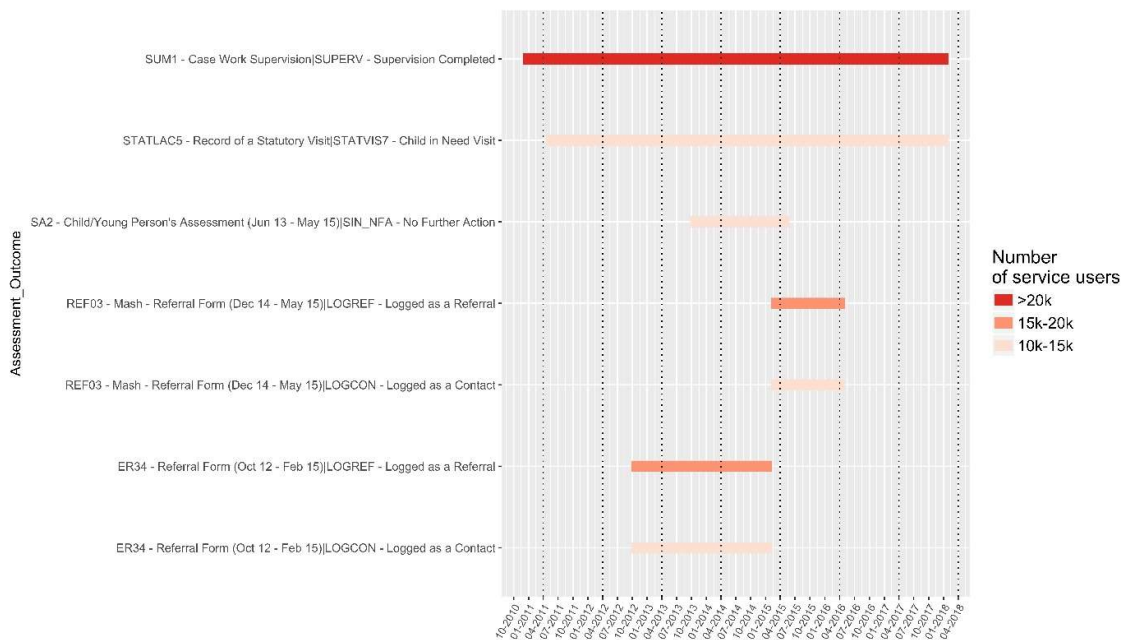


Figure 41: 7 of the 268 combinations are exist in the records of 10,000+ service users

There are a further 9 combinations that feature in the records of between 5,000 – 10,000 service users (see Figure 42) and, finally, Figure 43 shows the 252 combinations that feature in the records of under 5,000 service users and this equates to approximately 95% of the 268 combinations. A key feature of the analysis of the data in Figure 43 is the number of combinations that only relate to 100 service users or less.

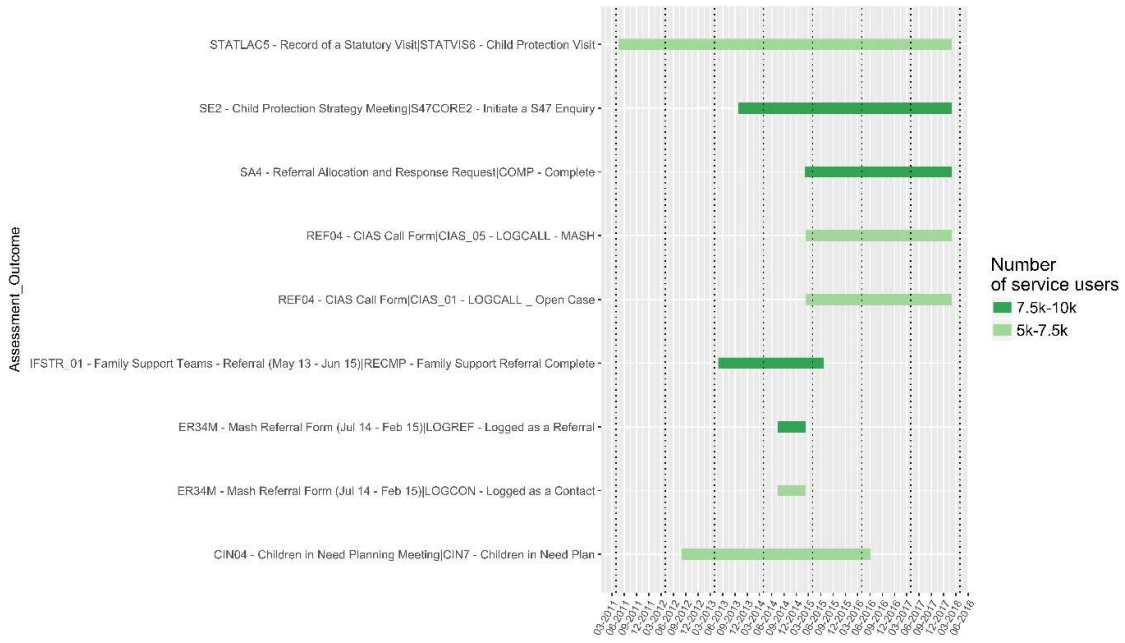


Figure 42: 9 of the 268 combinations are exist in the records of 5,000 – 10,000 service users

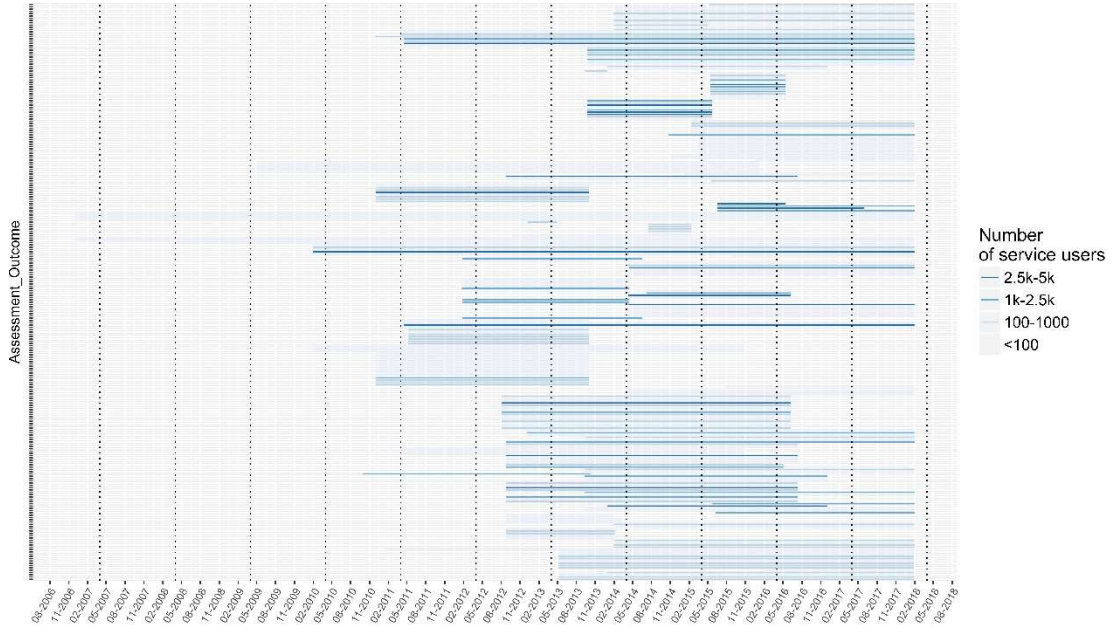


Figure 43: 252 of the 268 combinations are present in the records of less than 5,000 service users

5.9 Technology Focus – Findings

The case study considers the impact of data recorded as part of the IT system in operation for the recording of activities carried out as part of the assessment process for managing children's social care cases.

The most striking feature of the analysis carried out in this case study is the extent to which the recording process changes during the period with new recording requirements being introduced throughout the 12-year period that the case study covers. Moreover, there would appear to be the creation of blocks of recording requirement that begin and end at the same time. There are also a considerable number of combinations of assessment outcomes that only feature in the records of small number of service users.

In assessing the features of the 7 most used combinations, some key findings stand out. Firstly, the most frequently recorded outcome is that social worker supervision is undertaken, and this outcome combination does not appear to change in terms of the way it is described for the duration that the records cover.

Secondly, the combinations that represent the referral process are changed only to include the reference to MASH in early 2015, and this reflects the changes in social work practice at this time, when there was an increased emphasis on multi agency approaches to safeguarding children. It is an example of the system changes implemented to reflect organisational emphasis that impacts upon the recording practice that social workers need to follow, even if the actual social work practice itself remains unchanged in dealing with referral forms received by the Council.

Thirdly, five of the seven outcome combinations all feature start and end dates as part of the description that suggests a greater emphasis on this type of recording at the time and again, may reflect changes within the organisation that influences this type of recording at this stage. It would be necessary to conduct more detailed analysis with the Council and practitioners to understand at what point in time were the dates added to the description, as presumably they are added once it is determined that they will no longer be used, and the rationale and decision making process behind this behaviour.

These developments to the IT system reflect the practice that needs to be in operation in the recording of activity by the social worker. The earliest recorded outcome types within the dataset appear in 2006 and represent only a fraction of the number of outcome types introduced over the 12-year period. From the point of view of the IT system, each new type of assessment description and outcome type would need to be identified within the overall process and then designed, tested, and implemented to be operationalised. Additionally, social workers, administrators, managers, and other users of the IT system would need to be trained on these changes and how they impacted the overall recording practice.

The low use of the vast proportion of the assessment and outcome types suggest a lack of clarity of the purpose for the recording with only 16 types appearing in the records on 10,000 or more users. Furthermore, the pattern of making minor text changes to descriptions and including dates alongside the description would suggest that the system requirements were not understood or identified or that the original purposes that the system was intended for was subverted to reflect recording requirements that may have been required.

5.10 Case study 2: Process

A further set of analysis was carried out using a subset of the social care assessment process that breaks down the respective parts of the process into smaller elements using BCC's process in 2016 as a baseline. This was carried out in two parts. The first was to break the assessment process down into the smaller elements and then, with the assistance of Council officers, to assign the respective description combinations to the relevant parts of the assessment process. The outcome of this is set out in Table 22 below.

Process subset	Count
Children in Care (CIC) & Court work	72
Children in Need (CIN)	16
Child Protection & Safeguarding	58
Early Help & Intervention	37
Multi Agency and Safeguarding Hub (MASH) & Assessment and Short-Term Intervention (ASTI)	65
Other	20
Total	268

Table 20: Children's Social Care sub-process breakdown

In analysing the respective elements, we considered the processes outlined in Table 22 from two perspectives. The first was to compare the respective outcomes within the Children in Care, Children in Need and Child Protection and Safeguarding sub processes for the period each of the different elements was in operation. The second, using the other three sub processes, was to consider the frequency of the use of the outcomes.

5.10.1 Period of operation of outcomes

Each sub process is presented in the form of a graph which sets out the start and end dates for the period that the respective outcome was in operation. As with Case Study 1, it highlights the numbers of service users that have the specific outcome recorded within their

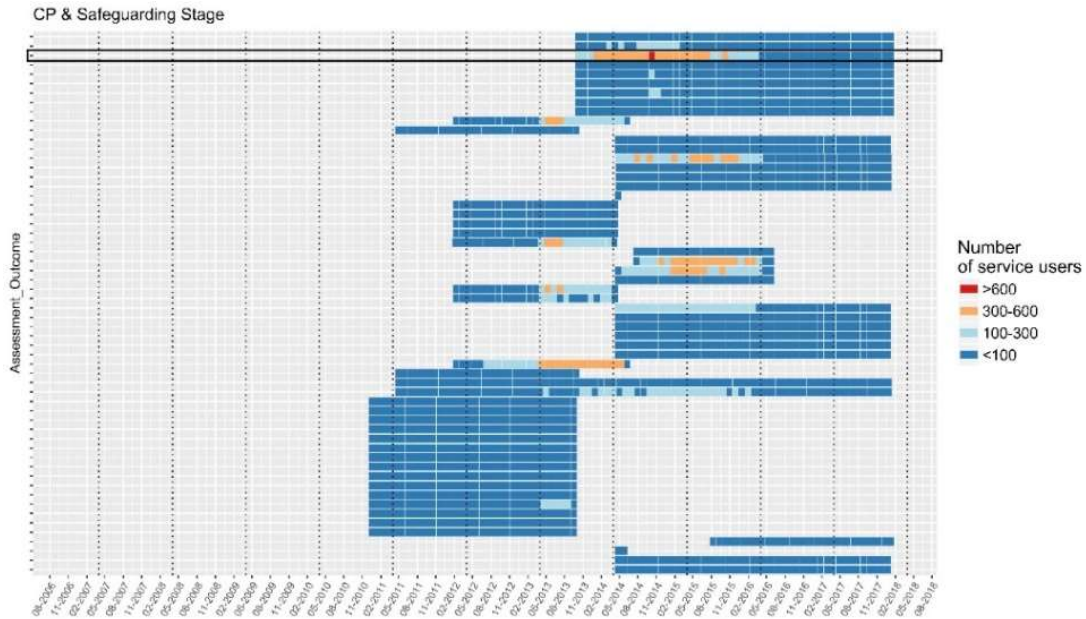


Figure 46: Child Protection and Safeguarding use of respective combinations

5.10.2 Frequency of use of outcomes

The analysis carried out for this case study consisted of a similar mapping of the combination types as in Case Study 1 with a further analysis of the number of service users and record types recorded within each sub process. For each of the three sub-process types, the 3 most and least used descriptions are identified. These are set out in below as follows:

Process description	Outcome Description	Sum	Frequency
The description of the process within the IT system	The description of the outcome within the IT system	The number of unique service users with this combination in their records	The number of records with this combination of process description and outcome

Early Help and Intervention				
Process description		Outcome Description	Sum	Frequency
Most used combinations				
IFSTR_01 - Family Support Teams - Referral (May 13 - Jun 15)		RECOMP - Family Support Referral Complete	8310	15028
FSTR02 - Family Support Teams Referral (2015)		RECOMP - Family Support Referral Complete	3430	5656
FSTC02 - Family Support Case Closure Summary		COMP - Complete	2826	4007
Least used combinations				

AFRF - Archive File Retrieval eForm	AFR1 - File Retrieved	1	2
CAM_MED - CAMHS - Medical Monitoring Form (Jul 12 - Feb 14)	CAM_MDS - CAMHs Medical Monitoring Form Completed	1	1
TES_SDQ - TESS - SDQ Summary Scores	COMP - Complete	1	1

Table 21: Early Help and Intervention 3 most and least used descriptions

MASH & ASTI			
Process description	Outcome Description	Sum	Frequency
Most used combinations			
ER34 - Referral Form (Oct 12 - Feb 15)	LOGREF - Logged as a Referral	18809	22823
REF03 - Mash - Referral Form (Dec 14 - May 15)	LOGREF - Logged as a Referral	15242	17867
REF03 – Mash – Referral Form (Dec 14 – May 15)	LOGCON – Logged as a Contact	12154	14061
Least used combinations			
ER34 – Referral Form (Oct 12 – Feb 15)	COMP – Complete	1	1
REF03 – Mash – Referral Form (Dec 14 – May 15)	MSPCLS02 – 3 Not a Safeguarding issue	1	1
REF03 – Mash – Referral Form (Dec 14 – May 15)	MSPCLS03 – 4 No longer a Safeguarding issue	1	1

Table 22: MASH & ASTI 3 most and least used descriptions

Other			
Process description	Outcome Description	Sum	Frequency
Most used combinations			
SUM1 - Case Work Supervision	SUPERV - Supervision Completed	26098	133855
STATLAC5 - Record of a Statutory Visit	STATVIS7 - Child in Need Visit	11323	46218
STATLAC5 - Record of a Statutory Visit	STATVIS6 - Child Protection Visit	6458	77995
Least used combinations			
CTPF2 - Area Case Transfer Part 2	COMP – Complete	1	1
SUM31 - Three Monthly Case Review	COMP – Complete	1	1
CWD2 - C W D Ess. Add. Healthcare Needs (Jan 08 - Oct 15)	CLOSE – Closure	3	5

Table 23: Other 3 most and least used descriptions

5.11 Process Focus - Findings

The analysis of the data within the 6 sub assessment processes highlights several key findings:

1. There are similar patterns of usage of the combinations throughout the different sub-processes, such as short periods of time where a specific combination becomes

- prominent in its use (designated by the darker shade) as well as significant numbers of combinations that are only recorded in the records of fewer than 100 service users.
2. Each sub process contains description combinations that have only been used in the records of five or fewer individuals, including in many cases where the combination has only been used once and for just one person during the period that it was in operation within the system.
 3. All 16 combinations identified as being within the 'Children in Need' sub-process, were operational at the same time, suggesting that these descriptions were specifically created for the recording of this data.
 4. The most recorded combination across the whole dataset is to record that supervision was completed and this appears in the records of 26,098 individuals and in 133,855 instances.
 5. A Record of a Statutory Visit also appear in the records of 22,386 individuals and in 190,365 records, but this includes different descriptions for the outcome varying between 'Child in Care Visit', 'Child Protection Visit' and 'Child in Need Visit' and the changes in this recording practice need to be analysed further to understand the rationale behind the changes and significance of the word changes from 'care', 'protection' and 'need'.
 6. There are significant number of descriptions that include an acronym that is difficult to assess without further analysis what this is likely to refer to, for example, "MSPCLS02 – 3 Not a Safeguarding issue" and "MSPCLS03 – 4 No longer a Safeguarding issue" within the MASH and ASTI sub process and have only been used on one occasion in the recording process. This could reflect a lack of understanding of what the acronym is referencing and therefore those recording the outcome of the

assessment are unclear as to the suitability of its use to reflect the status of the case as accurately.

5.12 Case study 3: People

The third case study focusses on the recording of information of the respective outcomes from the perspective of the individual and how a record of their time in care is impacted by the changes implemented in the 'technology' and 'process' themes. The two graphs produced below show the data as it is recorded against individual records. The first graph shows the recording against five individuals with the most assessment and outcomes types recorded within their individual records.

The data for these records begins in 2009/2010 and continues throughout the whole period of the dataset. Of note is the fact that only five of the six sub processes identified in Case Study 2 are present, with the 'Children in Need' sub process, absent from the records.

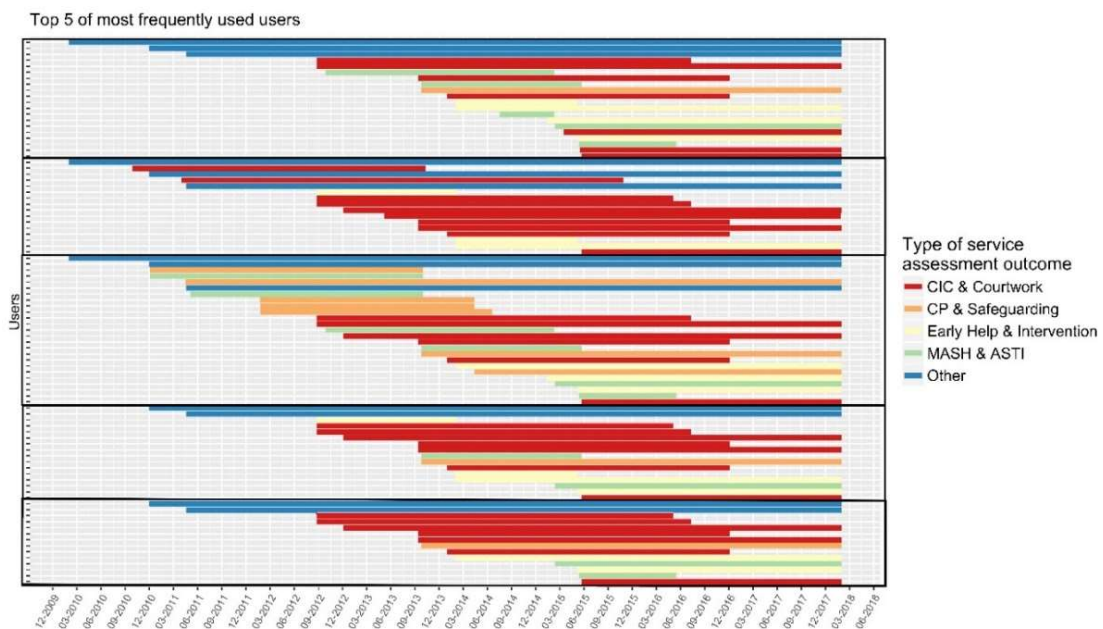


Figure 47: Service assessment use by top 5 user records

The second graph shows the recording for a single individual (i.e. the first individual from the graph above) with the most assessment outcomes recorded against their record. The thickness of the respective blocks reflects the number of instances where the recording has taken place.

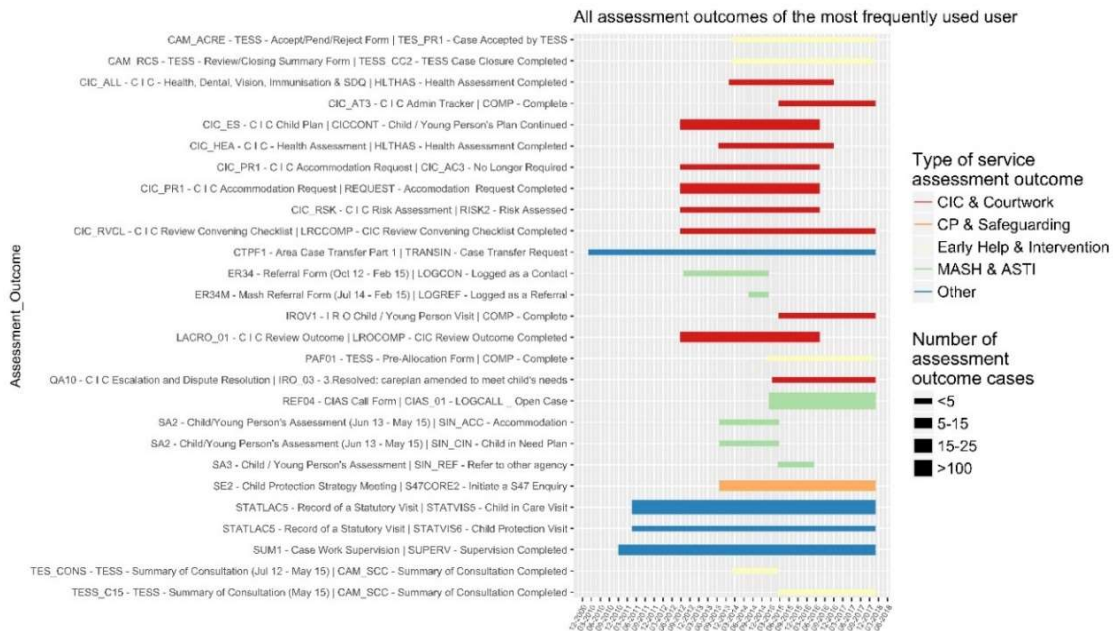


Figure 48: Service outcomes by individual service user

5.13 People Focus – Findings

As the graphs show, the research was able to represent the structure of the data at an individual level. The findings highlight the impact upon the individual and their interaction with the service as changes in the recording practice and technology are implemented. From the point of view of the individual, if they sought to understand their time within the care system using the data set out in the case study example, they would perhaps need to understand not just the changes to their personal circumstances but also the changes in recording and administration requirements in order to comprehend how the changes are to

be interpreted. Furthermore, they would need to understand the sometimes, subtle changes that occur in their record and which part of the sub process as it related to their specific case to support their understanding and how it influenced the service they received or the decisions taken about their time within the social care system.

The records represented in Figure 47 are for the 5 individuals with the most recorded outcomes within the system and show the number of years that the records cover. Each individual case begins with a recording in the 'Other' category which is primarily to do with the administration of the case and reflects that the system is primarily used as a case management system and the details of the data subject are combined within this wider set of records.

This is also reflected in the individual case record presented in Figure 48 which shows the number of outcomes within the 'Other' category being present in the record for the longest period in comparison to other sub-process elements. The length of time that these individuals have been in receipt of social care services also means that their records have been subject to the greatest impact of the changes that have taken place as a result of technology or process alterations that have occurred during that time. Furthermore, there is no evidence from the data and the research findings that changes to the system occur because of improving the rights of the data subject to access their data.

5.14 Discussion

The research outlined in this paper focussed on data derived from a social care system used in the recording of children's social care between 2013 to 2016.

We can see from the literature, advice, and professional guidance on advice for recording that each of the technology, process and people elements need to be considered as part of the wider recording practice and behaviour. The case studies highlight the fact that, individually, there is a logic to the changes that are being implemented and reflect a desire to improve the services being provided. The challenges appear to be that the changes within each element do not appear to be fully considered in the context of their impact on the other elements.

The first case study focussed on the use of data in a single graph and the number of service users within the dataset whose records will include the respective descriptors for assessment type and associated outcome. The number of different outcome types and the extent to which they are in operation highlight the changing nature of recording and recording practice for that period. There is also evidence that the recording practice is affected by other factors that see a prevalence of certain types of outcomes reflected during certain periods and this is shown in instances where the outcomes are present in the records of large numbers of individuals.

The use of these different types of outcomes has an impact upon the system in use as well as the social workers who are required to use the outcome types to record their interactions with the child. As highlighted earlier, the concerns of social workers in the effort involved in the administration of an information system for the purposes of recording can be considered to be valid given that for each new type of assessment and outcome type to be incorporated into an information system it must first be developed, tested, implemented and social

workers trained in its use in order for the recording practice to be understood and applied accordingly.

Additionally, the proportion of outcomes appearing in records is also significant. Only seven of the 268 outcome types appear in the records of over 10,000 individuals out of a total of over 63,000 individuals within the dataset.

The second case study focusses on the sub processes and provides more detail of the frequency of the use of the outcome types. There is low level use of the assessment and outcome types across the six sub processes used, with common patterns emerging within the case study of the use and implementation of the recording. The low-level use of a substantial proportion of the outcome types suggests a lack of clarity in understanding what needs to be recorded, why it needs to be recorded and ultimately, if the recording is reflective of the intention behind the original decisions and purpose for the changes made to the system. A key finding of the second case study is that whilst the data is taken from a casework system for children, the single most recorded outcome and the outcome that appears to be unchanged during the period of time in the scope of the research relates to the recording of the fact that supervision has been undertaken of the social worker managing that specific service user record at that time. Even then, this outcome type only appears in just over a third of all the records in the dataset. This means that the details of the social workers performance are linked to the record of the child because of the structure of the record within the system. This leads on to the focus of the third case study which considered to the recording from the perspective of the individual.

The third case study focusses on the impact of the recording on the rights of individuals in accessing their records and understanding their time in care. This has implications for the individuals in exercising their legal rights over the data within the system. Exercising individual rights to data requires disaggregation of the data or an explanation of what the data means for it to be meaningful.

5.15 Conclusions

The different elements of technology, process and people considered in the case studies showcase the various aspects of data recording in practice in the development, enhancement, and utilisation of an IT system for the purpose of supporting the provision of children's social care.

Each element points to a different component of the requirements within previous and current data protection legislation to manage the respective obligations contained therein on obtaining and managing personal data.

The first two case studies focus on how the IT system is configured and enhanced to record specific aspects of the children's social care assessment process. The development of an IT system containing personal data should ensure that the concept of 'data protection by design and by default' is built into the system meaning that the relevant processing activities and business practices are built into the system from the design stage right through the information lifecycle. As the case studies show the changes that are implemented to record different aspects of the assessment process have an impact over time as the record of assessment grows. Using the examples of recording descriptions identified in these case

studies and the respective subsequent use of them in actual practice can help shape future development, in so far as, critically evaluating the need for the system enhancements and thereby avoiding unnecessary costs in the implementation of the changes and the associated training for social workers.

Similarly, consideration needs to be given to the impact of changes to the system on the personal records being created because of the assessment process. As changes are made to the recording system, they inevitably impact upon the structure and continuity of the personal record and, as such, can affect the manner in which the record is interpreted, should the service user, whose record it is, wish to understand their time in care or exercise their legal rights to their data as the records are created or in the future. The principles of data protection by design and default should also be strongly reflected in the system design as far as data subject rights are concerned, particularly in circumstance such as social care, where as we have seen from these case studies, the personal records are interspersed with details of the conduct of others.

The principles of data protection by design and default, which feature in the GDPR at Article 25 includes the following guidance at Recital 78,

When developing, designing, selecting and using applications, services and products that are based on the processing of personal data or process personal data to fulfil their task, producers of the products, services and applications should be encouraged to take into account the right to data protection when developing and designing such products, services and applications and, with due regard to the state of the art, to make sure that controllers and processors are able to fulfil their data protection obligations.

In the context of developing this practice within a social care IT system, the above recital is seeking to take the technology, process and people elements as described in this chapter to be considered equally and collectively when the system and services are developed so that changes to one element do not impair the ability of the organisation to fulfil the range of different data protection obligations, for example, ensuring that data subjects are able to exercise their legal rights to their data and have it presented in a manner that is intelligible and easily understood. Equally, giving due consideration to changes in recording practice that are potentially unnecessary or add little value, such as the low level examples highlighted in the 'Process' case study, could be an example of the practice of data minimisation standards through ensuring clarity of the recording need and the creation of multiple, but very similar, outcome types.

Finally, these design principles can be used to ensure that the technology meets the purpose for which the personal data is being processed. We see in the 'Technology' case study that the most commonly recorded outcome relates to the fact that social work supervision has been undertaken, which, it could be argued that is not the primary purpose of the system, rather it should be focussed on the recipient of the services. As such, prior to the development and deployment of a system, clearly defining the purpose of the processing of the personal data and limiting the scope to this processing will not only ensure a clarity of purpose which can be maintained through future changes but will also demonstrate ongoing compliance with the organisations' data protection obligations.

The research conducted within the scope of this study has considered the circumstances and importance within an organisation of the data pipeline and how understanding the structure

and attributes of data enable data analytics, data re-use and data-driven innovation in support of delivering a range of council objectives, whether service improvement, managing financial challenges or understanding service delivery models.

Using the case study examples set out in this research and the approaches taken in accessing the data and the focus of each case study, any organisation, could begin to develop of a programme of activity linked to its data analytics ambitions that, as set out in Chapter 4, are aimed at improving organisation capability through providing reliable research, analysis, and data, improving processes or increasing service quality as part of a wider organisational or cultural change programme. Equally, an organisation could also take a broader view at the onset of a project or programme of the data requirements, identifying primary and secondary purposes for the data, as part of the development of a system that supports the delivery of key services to a key demographic as part of a service improvement programme, such as the need to improve Children's Services in a local authority, such as that demonstrated in the case study in Chapter 5.

As highlighted in the examples of BCC's aims and ambitions for developing its data analytics capabilities, understanding the various purposes for data to support different aspects of organisational objectives that aim to improve the use of data will influence the extent to which investments in technologies are made and realised. Equally critical in bringing out the lessons to be learnt for how BCC, and other organisations, might practically set out developing and improving their capability in data analytics as data-driven organisations, is the role of leaders within the organisation and their willingness to drive through and manage the legal,

ethical and technology challenges that need to be addressed for an organisation to deliver on its stated aims and objectives.

Chapter 6 Application and Research Impact

6.1 Introduction

This chapter reflects on the research conducted during this period of study and considers the impact of this research to the local authority sector and within the information governance field. The different case study examples of the research outlined in the earlier chapters of this thesis aim to demonstrate how data collected by a UK local authority can be utilised in a compliant manner to inform governance, data analytics and decision-making processes. It also brings together literature from other studies in a manner that has not previously been done, particularly with the use of the specific data set accessed from BCC.

The research has also benefitted the Council in a number of ways through the presentation of the research to senior council officers to demonstrate the capability of data analytics, the creation of an internship to embed research outcomes into the organisation and develop the skill set of council employees involved in analytical roles with the Council. The involvement and inclusion of senior officers from the Council is an important feature of the research and its potential applications. What is clear is that without the appropriate level of senior officer buy-in or sponsorship, both for supporting the intent behind the research motivation and making themselves available to receive and provide feedback, then the level of impact would be lessened, as the linkage back to organisational priorities and plans can be understood and championed by these senior leaders. This chapter also describes the generalisability of the approaches used within this research for use within other local authorities and potentially the wider public sector.

6.2 Uniqueness of the Research

Through the literature reviews conducted during this research there is evidence of related literature that focuses separately upon the application and advancement of data analytics, the role of organisational leaders and change programmes, the service provision of health and social care and information governance and ethical obligations. However, to the best of my knowledge, the different domains have not been examined collectively up to this point in time.

As some of the literature research points out, several different factor can influence the challenge of utilising social care data for research and analytical purposes and these include the sensitivity of the data about care service users and how the services were being delivered to those users. The potential issues related to privacy and the re-identification of a person if the data is compromised even if data ethics and governance standards were appropriately followed. Furthermore, there are issues of data quality, recording and the way in which systems are developed and utilised that present problems is assessing the suitability of the data for the research purpose. As such, the potential misuse of the data and the impact on vulnerable people in receipt of social care service or known to the local authority can have major implications and, correctly, give reason for pause prior to any analysis being conducted.

We believe, therefore, that this work is unique in bringing together these different components that combine data analytic technology with local authority sensitive social care data following appropriate consideration of the relevant ethical and legal issues. The recommendations from this work have been fed back to the Council and have helped to improve the understanding of performance within adults and children's social care, provide

the basis for demonstrating the data analytics capability available to the Council through case study example and established an approach to the ethical use of the data to support future research proposals.

For example, using the approaches utilised and explained in the initial stages of this research, a similar simple extract was obtained from the Council’s Customer Relationship Management system (CRM) to try and understand the structure, nature and content of data as captured in respect of requests from citizens and service users for services from the Council via its contact centre. This covers the wide range of services and requests received by the Council and reflects the initial stages of recording of service types and subsequent flows of data into the organisation to manage the requests. A data extract was taken from 3 separate dates February 2019, August 2019, and February 2020 to highlight the changes over that period of the services recorded.

Date	Number of service descriptions	Number of records
12022019	23334	1170517
12082019	23066	1185728
25022020	23004	1189511

Table 24: CRM service records

An extract of the top thirty shows a range of service descriptions covering waste, recycling, fly tipping, benefit and welfare, housing repair and tenancy issues and Blue Badge, leisure services and pest control. The service descriptions are number of records are similar to the service descriptions from the social care system used throughout this research and as such further investigations could be available by adding further data attributes that relate to the service request, for example, postcode data or by increasing the number of dates that the data is captured to provide temporal analysis as shown in the research.

Date of extract: 12022019		Date of extract: 12082019		Date of extract: 25022020	
Description	No. of Records	Description	No. of Records	Description	No. of Records
Special Waste Collection: Large Items	90655	Missed Refuse / Recycling- SREQ	97452	Missed Refuse / Recycling- SREQ	100699
Missed Refuse / Recycling- SREQ	84238	Special Waste Collection: Large Items	93208	Special Waste Collection: Large Items	94868
Green Recycling Service-SREQ	54548	Green Recycling Service-SREQ	60928	Green Recycling Service-SREQ	58758
Service Enquiry Tenancy and Estates	54335	Service Enquiry Tenancy and Estates	54663	Service Enquiry Tenancy and Estates	54207
Welfare Home F2F Interview - English	46570	Welfare Home F2F Interview - English	46355	Welfare Home F2F Interview - English	46306
Pest Control - Domestic	25330	Pest Control - Domestic	26506	Pest Control - Domestic	26911
Clinical Waste: Request Collection	23378	Clinical Waste: Request Collection	24597	Clinical Waste: Request Collection	25049
Wheelie Bins Enquiry-Sreq	22996	Wheelie Bins Enquiry- Sreq	24443	Wheelie Bins Enquiry- Sreq	24819
Am I on the register? - SREQ	20268	Am I on the register? - SREQ	19837	Am I on the register? - SREQ	19746
Special Waste Collection: Large Items.	16305	Replacement Missing-SREQ	17389	Replacement Missing- SREQ	18398
Missed Waste/Recycling Collection	15519	Special Waste Collection: Large Items.	16049	Special Waste Collection: Large Items.	16024
Replacement Missing-SREQ	15245	Missed Waste/Recycling Collection	15236	Missed Waste/Recycling Collection	15181
Home Options Interview	15051	Home Options Interview	14950	Home Options Interview	14936
Report a Housing Repair	15045	Report a Housing Repair	14847	Report a Housing Repair	14817
Cocks Moors Woods	14737	Cocks Moors Woods	14651	Cocks Moors Woods	14636
Verification	13861	Verification	13774	Verification	13752
Green Recycling Service-SREQ.	13306	Housing Needs	13075	Housing Needs	13056
Housing Needs	13159	Wyndley Leisure Cent	12292	Wyndley Leisure Cent	12280
Wyndley Leisure Cent	12368	Adults Blue Badge	12171	Adults Blue Badge	12148
Adults Blue Badge	12321	Welfare Home F2F Interview - English.	10884	Welfare Home F2F Interview - English.	10877
Welfare Home F2F Interview - English.	10934	Hsg - Tenancy Conditions Advice	10138	Hsg - Tenancy Conditions Advice	10105
Hsg - Tenancy Conditions Advice	10324	Local Welfare Provision - Crisis Grant	8937	Local Welfare Provision - Crisis Grant	8918

Local Welfare Provision - Crisis Grant	9040	Flytipping Removal	8385	Flytipping Removal	8486
Flytipping Removal	8148	Housing Repairs Enquiry	7881	Housing Repairs Enquiry	7847
Housing Repairs Enquiry	8006	Missed Refuse / Recycling- Data Error	6882	Missed Refuse / Recycling- Data Error	7075
Housing Repair: PS Heating and Hot Water	7015	Stechford Cascades	6865	Stechford Cascades	6854
Stechford Cascades	6909	Housing Repair: PS Heating and Hot Water	6858	Housing Repair: PS Heating and Hot Water	6831
Benefit new claim	6882	Benefit new claim	6818	Benefit new claim	6808

Table 25: Top 30 types of CRM service types

Also, as found in the earlier research, there are a significant number of examples of service records that are included as a single record and these are highlighted in the list of ten service records related to wheelie bin service requests.

Date of extract: 12022019		Date of extract: 12082019		Date of extract: 25022020	
Description	No. of Records	Description	No. of Records	Description	No. of Records
wheelie bin replacement fee	1	wheelie bin size dispute	1	wheelie bin lid missing-replacement cost	1
wheelie bin collection	1	wheelie bin size allocation	1	wheelie bin issues	1
wheelie waste bin	1	wheelie bin replacement	1	wheelie bin household and recycling roll	1
wheelie process	1	wheelie bin refuse bin men	1	wheelie bin household	1
wheelie men	1	wheelie bin refuse	1	wheelie bin feedback	1
wheelie bins still not delivered	1	wheelie bin proposal	1	wheelie bin enquiry	1
wheelie bins not wanted	1	wheelie bin pod	1	wheelie bin delivered no wanted	1
wheelie bins not delivered	1	wheelie bin placement	1	wheelie bin assessment copy	1
wheelie bins non collection	1	wheelie bin payment	1	wheelie bin and rubbish bags not collect	1
wheelie bins left across drive	1	wheelie bin not suitable	1	wheelie bin Charge	1

Table 26: Examples of single CRM service records

As with the case study examples considered in Chapter 4, there is the opportunity to utilise the same techniques and approaches across the ten case studies to further understand and analyse the data recording and data flows that occur following the capture of the initial service request recording. This can include looking at the most requested services as well the nature, need and purpose of recording the single records as highlighted in Table 26. This approach would also support the Council's data analytics ambitions.

What this example highlights is that the Council holds a significant volume of data that reflects the very broad range of services that it provides or that are requested by its citizens. Understanding the scope of the data held by a local authority, how and why it is recorded and what attributes it contains is an important lesson to be drawn from this research. This will have implications for local policy decision making as it will add to the knowledge and understanding of service delivery and impact on local people of changes to services. Being able to draw on datasets that contain sufficient levels of detail to allow for a granularity of analysis that is desired by organisations is critical to the success of data strategies and organisational changes programmes as they allow for an assessment and analysis that seeks to challenge existing culture and organisational behaviours.

This approach will also have implications for service delivery practice and as highlighted in Figure 5 earlier, the types of challenges senior officers within BCC (and no doubt other organisations, both public and private) of not having adequate or appropriate data about services or having the appropriate skills to interpret the data can only start to be addressed if a clearly defined approach is established that encompasses the end to end process and is supported by a clear understanding of data recording, purpose and re-use. These areas are

potential future areas of research and can build upon the literature and scientific knowledge that has been referenced within this thesis.

Furthermore, the approaches to data access and data analytics demonstrated in this research can be used to support, influence, and contribute to wider national conversations about the use of data held within the local authority sector. Previous analysis of the potential for the use of data held by local authorities, such as the discussion paper by NESTA²⁰¹ set out the areas where local councils can focus to make better use of their data and drive and further research can develop these themes.

The NESTA research was supported by the Local Government Association (LGA) who are the national membership body for local authorities who work to support, promote and improve local government, recognise the need for and use that data plays an increasing role in designing, delivering and transforming public services to improve outcomes and drive efficiencies within current financial constraints.²⁰² BCC, as a member organisation of LGA, can look to support the LGA's objectives by sharing the outputs of this research and contribute to the wider sharing of knowledge and lessons learnt from this research.

Equally, to further support the sharing of the knowledge from this research and build upon, BCC can also work with organisations such as the Open Data Institute²⁰³ to further develop the understanding of requirements for data ethics²⁰⁴ in this use of data and which have featured within the research.

6.3 Information Governance Considerations

As set out in Chapter 2, this research sought to further develop the understanding of information governance and data analytic considerations using case studies set out in Chapters 3, 4 and 5. The first part of Chapter 3 set out how ensuring that due consideration was given to the ethical use of the data that an organisation could be able to demonstrate its compliance with the 'fairness' element of the first data protection principle. This case study provides a structure for accessing and sharing data for research purposes that can be applied to future research projects and programmes. This is particularly and increasingly more relevant as the ICO have recently appointed their first data ethics advisor,²⁰⁵ signalling their interest and importance to this area of information governance.

The second part of Chapter 3 focussed on the early results from the research and the presentation back to the Council of these results and Chapter 4 focussed on case studies that seek to demonstrate how the pseudonymised personal data can be applied to a range of challenges facing local authorities and how the data can be used to inform and provide an evidence base for supporting future decisions on spending, service improvement or changing business processes to support service provision.

Chapter 5 focusses on system developments and the impact upon data recording, the creation and maintenance of personal records and how these may inform the way data is recorded to take account of the obligation for embedding 'privacy by design' concepts into systems that capture and record personal data.

Collectively, the case studies provide analysis and recommendations that can support the Council in understanding its approach to social care services from different perspectives, thereby informing and influencing future decision-making processes. The application of analytic tools and visualisation approaches helped the Council to gain new insights from the information held within the local authority as well as identify potential pitfalls and issues in the way the data is captured and its quality for the purposes of re-use. This has shaped and informed discussions within the local authority to begin to gain meaningful outcomes from personal data resources held, emphasised the value of the data and its possible uses and, for further developments, established approaches to other personal data held by a local authority that has similar characteristics that can be analysed in the same manner, such as housing tenancy data, for example.

6.4 On-going Projects

6.4.1 BCC Information Management strategy

Throughout the period of study, the author has been employed at BCC and sought to embed the outputs of the research into practice as part of the Council's own work in seeking to do more with its data. The Council's Information Management Strategy sets out its desired vision (see Figure 49) to:

“Make the Council an information-led, and evidence based, organisation working with sound and reliable data for the benefit of its residents.”

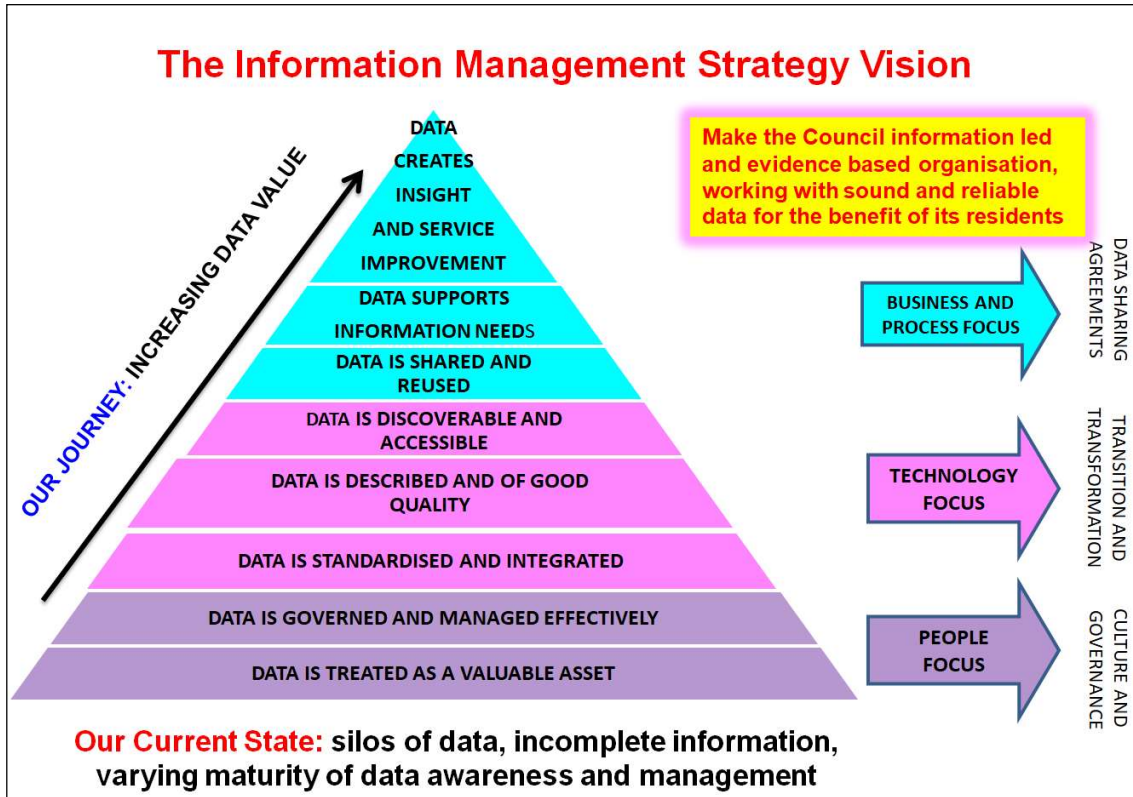


Figure 49: Birmingham City Council Information Management Strategy vision

The research that has been conducted during this study has enabled me to help inform the development of this strategy and, going forward, influence and contribute to the implementation of the aims and objectives set out in the strategy.

As set out in Figure 49, the Council’s plan is to increase the value of the data that it has in its possession to help inform future decision-making processes, whether financial, process or technology. The case study examples set out in this thesis have highlighted the state of data throughout the information life cycle, it is possible to apply the processes, tools and techniques established in the course of this research and re-apply them to projects and programmes that will emerge from the strategy.

Indeed, as part of the development of the governance processes within the Council to inform the ethical use of data, a proposal is being developed to create a research and ethics board to oversee the projects in the scope of the strategy to ensure that the Council takes due consideration of its ethical responsibilities to the data in its possession and be able to demonstrate that its re-use of personal data is compliant with its legal obligations.

6.4.2 Security, Privacy, Identity, and Trust Engagement NetworkPlus (SPRITE+)²⁰⁶

As part of the author's ongoing development and understanding of issues surrounding the re-use of personal data, both in an academic and work context, I have been invited to join SPRITE+ as a non-academic Expert Fellow.

The network invited applications from a wide range of Expert Fellows to join a diverse group of expert scholars, each bringing deep expertise and creative thinking to SPRITE+ activities, and together providing a broad, challenging and informed range of viewpoints on trust, identity, privacy, and security in digital contexts.

The scope of SPRITE+'s remit is broad and can be viewed through many disciplinary lenses. The aim for the multi-disciplinary group is to build on the track record of research in trust, identity, privacy, and security in digital contexts. Additionally, the network sought to broaden its reach by inviting those who had not previously worked specifically in this area but who may have expertise in related or pertinent topics or in methods that have not previously been applied to digital security challenges.

The programme has three main goals:²⁰⁷

Goal 1: Build and develop the research community

Research in digital security, privacy, identity, and trust has tended to be dominated by engineering disciplines. SPRITE+ activities will also draw in researchers in humanities, behavioural and social sciences, and from other areas of 'security science'.

Goal 2: Engage stakeholder communities

SPRITE+ creates opportunities for industry, university, government, law enforcement, and third sector partners to engage constructively with the broad research community. Our aim is to build a collaborative community of researchers and stakeholders, together tackling the most important and complex challenges to security, privacy, identity, and trust in the future Digital Economy.

Goal 3: Draw up roadmaps for research

Working with academic and non-academic partners, we identify broad Challenge Themes (CTs) related to current and future problems. We will fund activities that explore, and test new ideas related to the CTs, and that create new collaborations between academic disciplines, and between academic and non-academic partners. The outputs will be research roadmaps to address these CTs, articulating the current 'state of the art' and highlighting priority gaps in knowledge. SPRITE+ activities will thus shape the direction of research and investment within and beyond its funding.

I have attended the first network meeting of the group to support the development of these themes and will continue to contribute to the Challenge Themes as part of this network. As part of this group, I will have opportunities to shape the future of research in this area, achieve impact, and develop enjoyable and productive relationships with new collaborators within and beyond the academic sector.

I will participate in the requirements setting meeting, alongside non-academic partners. These meetings are intended to identify lines of collaborative research to address the most significant challenges. These challenges will be the focus of future SPRITE+ activities, including research calls, workshops, industry attachments, and the development of working groups.

6.4.3 MIRRA: Memory—Identity—Rights in Records—Access

In the course of this study, I had the opportunity to collaborate with researchers working on MIRRA: Memory—Identity—Rights in Records—Access, a project which is a participatory action research project co-produced with care-leavers and researchers based at University College London (UCL). A literature and theory review to the project can be found in this journal article entitled “Child Social-Care Recording and the Information Rights of Care-Experienced People: A Recordkeeping Perspective”, published in *The British Journal of Social Work*, bcy115, <https://doi.org/10.1093/bjsw/bcy115>

The project focusses on a number of key features that are common with this research, namely, that it proposes to use Council data, it is focussed around Children’s Services and using data to support vulnerable or at-risk children as well as raising issues around the ethical and lawful use of personally identifiable data. Furthermore, it considers the impact on the

individual, the personal records created because of their interaction with the Council and the challenges faced by the individuals in accessing and understanding their time in the care of the local authority.

I have been engaged with this project in a work capacity, but also, my research is specifically looking at data held about vulnerable children and adults within local authority systems and how this can be extracted to provide insight to improve services to vulnerable individuals.

I collaborated with the lead researcher from UCL by facilitating access to staff in BCC who were interviewed as part of the research and also arranged for the researcher to attend a conference which I hosted at the offices of BCC to share the outputs of the research in 2018.

This initial pilot project was undertaken to scope and justify the research prior to the two-year project. UCL are currently awaiting a response to the funding proposal to continue the work and, through my role at BCC, I have agreed to support the project to further develop the ideas and research aims of the next phase of MIRRA in order to support the Council's own understanding of its obligations to record keeping and access for individuals to their records.

A project has received a further funding for a one-year follow-up project named MIRRA+, with the aim to develop a set of specifications to underpin a new record-keeping system for use in child social care which centres the needs of the person in care. I have been invited to participate in one of two symposia planned focussed on the following areas and build on the research carried out in this study:

- System and content creation (exploring participatory content design and the contribution to the care record by the person in care)
- Access to and use of records (care leavers' experience of accessing, viewing and using their records)

6.5 Generalisability of the Research

The use of social care data held by BCC as the focus of the case studies set out in this thesis provide the basis for the wider dissemination of the research outcomes. Other local authorities with similar social care responsibilities and with the same obligations for the management of personal data can utilise this research to inform their own practices.

The ethical use of the data and the governance processes to support this, suggested within the research, can also be applied by local authorities who are considering how to demonstrate their compliance with statutory obligations.

Furthermore, other personal data held by local authorities, obtained in the course of the discharge of their duties, such as housing, taxation, leisure services, refuse collection and so on, can also be considered for access and re-use for research purposes and the data analytic case studies demonstrated within the thesis will be equally applicable across these areas of council activity.

Chapter 7 Conclusions and Future Research

7.1 Introduction

This research has been undertaken in association with BCC, utilising data held within the Council's social care system and the outcomes have been fed back to senior officers within the Council. The research has also taken account of the Council's ambitions for develop its own data analytic capability and using this as a basis, the case study examples that have been developed during the course of the study have sought to demonstrate how the outputs of this research can have add value to the achievement of those ambitions.

The research questions identified in this study considered

1. How can the release of data held within public sector organisations help develop new models of service delivery?
2. How can improved usage of data at an urban level to support service delivery models that are focused around children, but target those at risk and vulnerability?
3. How can public sector organisations balance the rights to privacy and a personal life when sharing information, identifying, and tracking children at risk?

The research has considered several different elements within the information governance eco-system to demonstrate the value that can be obtained for analytical purposes from data held by a local authority. It has outlined the processes involved in accessing the data in a compliant manner, used state-of-the-art data analytic techniques to better understand social care services provided by the Council and identified challenges in the development and implementation of IT systems that hold this data.

This research is particularly relevant given the changes to the legislative regime introduced in 2018 which impact upon the responsibilities of a local authority in the handling of the data it has in its possession, particularly, in respect of the explicit principle relating to accountability for the personal data. Additionally, this research was conducted during a period of financial austerity and the case study examples highlighted in the research demonstrate how personal data held by a local authority can be applied to possible changes to future service planning and provision to inform budget saving proposals, given the financial savings challenge the Council is facing. Delivering savings of this scale, whilst protecting and safeguarding the most vulnerable citizens and their personal data, within a growing urban population, is one of the biggest challenges for this, or any, local authority.

This research has made three contributions towards these aims and in answering the research questions:

Firstly, Chapter 3 addresses the first research question and considers how the release of data held within public sector organisations help develop new models of service delivery, describing the processes involved in accessing the social care data through an agreed protocol that ensures that legal and ethical issues are addressed prior to the re-use of the data. This demonstrates an understanding of the obligations imposed on the re-use of the data, the nature of the data that is to be accessed and compatibility of the re-use purpose with the original purpose. The Chapter then presents the initial findings of the research as presented to the Strategic Director at BCC and highlights novel application of data analytic techniques that can be employed to obtain detailed analysis of different aspect of historic provisioning

of social care services to better understand costs, service user profiles, trends in service delivery and the possibility to forecast potential future demands for the services.

Secondly, in Chapter 4, new spatial-temporal data analysis is presented and is evaluated through several case studies, seeking to address the second research question that focussed on how improved usage of data at an urban level could be used to support service delivery models that are focused around children, but target those at risk and vulnerability. The range of case studies highlighted aims to demonstrate the capability of data analysis and visualisation techniques available to be integrated into the practice of the local authority to develop its own capacity and understanding of data analytics and associated skills. It develops the data analytic concepts further by introducing further case studies that showcase the different ways in which social care data can be utilised to analyse the continuity of data flows within the adults social care assessment process and then against budget savings proposals that form part of the Council's annual public consultation and budget setting process.

The analysis of the data continuity within the adult social care assessment process provides insight into the way data is recorded within an IT case management system and the links to the delivery of services. The outcome of the research demonstrates how the data can be analysed to identify issues with data flows and subsequent decision making as well as potential issues with the accuracy of the recording within the individual records of service users. This analysis can be used to improve the business process flows to ensure that data is captured consistently and correctly for each person and at each stage of the process. Furthermore, it can support improvement in the quality of the recording for individual records

and ensure that where assessments have been completed as such and reflect the true position of the individuals' assessed needs, rather than suggest ambiguity.

The evaluation of the budget savings proposals to promote independent travel, changes to internal care services for younger adult day care and an assessment of home enablement service further demonstrate the range of re-use for a dataset. The analysis provides insight through linking historical data to the savings proposals and this can provide evidence to support the feasibility of the proposals. This can help develop approaches to future budget saving proposals by setting out more clearly the current and historical use of a service, the data that has been used to support the proposals and the potential impact of the savings proposals whether from a geographical or an individual or community perspective.

Thirdly, Chapter 5 features an analysis of the data flows within the children's social care assessment process, highlighting the challenging environment in which data is captured and utilised to support children identified as being at risk and addressing the final research question in considering how public sector organisations balance the rights to privacy and a personal life when sharing information, identifying, and tracking children at risk. The research takes the approach of assessing the data through the 3 lenses of technology, process, and people to demonstrate how the influence of each of the elements impact upon the overall outcome of the data that is subsequently recorded. The specific case studies seek to understand the flow of data and the analysis that, as with earlier case studies, how changes to manner in which the systems and processes are developed and implemented can be improved to better serve the respective elements of the information lifecycle by recognising the influence of each of the elements on each other and how better understanding this impact

could improve the overall quality of the information captured and thereby support better compliance with the different legislative and practice obligations that exist within children's social care.

7.2 Future Research

As discussed earlier in this research, the case study examples presented offer capabilities which are not currently in use within the public sector, particularly given the level of data that was available to the researchers within this study. It is possible to develop the research with more sophisticated statistical analysis methods and data analytic techniques, for example, linked to the Council Information Management Strategy. This could, for example, feature combining other data sources held by the Council to develop a deeper understanding of service provision or their specific impact upon the lives of citizens. An approach such as this, however, would be dependent on the availability and format of alternative data sources and the management of ethical concerns relating to privacy risks and issues. Whilst this presents a challenge, it should not be dismissed as developing the robustness of ethical considerations to personal data held by public sector organisations is an issue that large cities such as Birmingham should be at the forefront of and lead the debate within the field.

Furthermore, based on the experience of conducting the research outlined in this thesis, there are further potential areas of research using council held data that could warrant further investigation, either by the Council or in partnerships with external partners. These include:

- a) Spatial-temporal analysis using postcode level data to further analyse service provision across other services provided by the Council. The ability to correctly use

postcode level data provides a level of granularity and comprehension of service delivery to the Council within its boundary in order to improve its understanding of service delivery and support policy making or budget allocation decisions based on evidence of changes in demand.

- b) Using the methods utilised within this research, the Council can review its data collection practices and assess whether existing business processes are effectively capturing the data that is required for the delivery of the service, to ensure the accurate recording of personal data and, at the outset of the data capture, assess the possibility for re-use of the data and build this into its processes.
- c) The analysis of datasets, from multiple public sector organisations working with the Council on similar objectives, such as the Sustainability and Transformation Plan, with a geographical component, can benefit from the ethical and analytical approaches used within the course of this research.
- d) There are also several research projects that are emerging from the Council's Information Management strategy which can benefit from the methods employed in this research. Early proposals include education attainment rates across the City, Special Educational Needs service provision, recycling rates and waste collection.

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"1. Personal data shall be:
(d) accurate and, where necessary, kept up to date; every reasonable step must be taken to ensure that personal data that are inaccurate, having regard to the purposes for which they are processed, are erased or rectified without delay ('accuracy')"
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