

# A Study of Data Continuity in Adult Social Care Services

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## Abstract

Financial challenges in adult social care services are a considerable concern for UK government. With an ageing population, UK local authorities were reported to have spent £168 million more than budgeted in 2015–16 and had struggled to maintain care quality and manage unprecedented demand. We report on the assessment process employed in adult social care in Birmingham, the UK's second largest city, and use data-analytic methods to examine the flow and continuity of data from referral, through the assessment process, to the resulting service provision. We identify the decision-making points and the data recorded for service users throughout the workflow. Data are derived from the local government social care system in Birmingham and span 2013–16. Findings highlight the complexity of the social care system, the fragmentation of the data and the discontinuity of data flow within the system. This data analysis resulted from a two-year study commissioned by Birmingham City Council as part of the 'case for change' following several poor Ofsted reports. Our commission was to understand what could be ascertained from a data-led investigation, independently of how the data were collected and used. This research establishes the foundation for service improvement and potential resource savings.

**Keywords:** Assessment, data analysis, local government, service users, social care

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## Introduction

The social care assessment process captures an important interaction between local government and individuals. According to the [Care Act \(2014\)](#), 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 ([Lea, 2014](#)). [Milner et al. \(2015\)](#) 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 ([NHS Digital, 2011, 2014, 2016a, 2016b](#)): 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 ([Kane and Kane, 2004; Clarke, 2011](#)). 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 ([Walker and Beckett, 2003](#)). This creates significant challenges for local government because needs and outcomes must be serviced equitably, regardless of the fact that the mechanism for meeting needs will differ, depending on local circumstances and individual preferences ([Abendstern et al., 2011](#)).

Adult social care in England has seen major restructuring over time and this has led to the introduction of 'personalisation', where an individual is placed at the heart of service provision to maximise accessibility and reinforce personal solutions ([Leadbeater et al., 2008; Lymbery, 2014](#)). 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 ([Humphries, 2011](#)). However, other studies suggest more mixed evidence for personalised services reducing local authority spend ([Slasberg et al., 2012, 2013; Zamfir, 2013](#)).

Budgetary challenges in England since 2010 have resulted in a 26 per cent reduction in financial resources since 2014–15 ([HM Treasury, 2010](#)), and it has been forecast that this will significantly impact adult social care service provision ([Glasby, 2011; Humphries, 2011](#)). The [Local Government Association \(2016\)](#) (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 (NHS Digital, 2016b). Alongside the funding gap, councils with social care responsibilities spend roughly 30–35 per cent of their total budget on adult social care (Local Government Association, 2016). The Association of Directors of Adult Social Services (2016) (ADASS) suggest that necessary savings to adult social care budgets by local authorities—approximately £940 million—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 client 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 (Cooper *et al.*, 2011). 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 (Goldberg and Warburton, 1979). Using data from existing assessment documents provides the basis for identifying requirements and improving decision making (Foster *et al.*, 2008).

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 Health (2010) 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 (Audit Commission, 2011); 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 Health (2016) has argued that ‘living with independence’ may relate to particular 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 in assessments and reviews in twelve of the last fourteen years (Audit Commission, 2012). 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 (Birmingham City Council, 2015).

The data analysis documented in this article is a result of a two-year study commissioned by Birmingham City Council, as part of an agreed ‘case for change’ following several poor Ofsted reports. Our commission was to understand what could be ascertained from a data-led investigation, independently of the context of how the data were collected and used. We use data-analytic methods to examine the flow and continuity of data from referral, through the assessment process, to the resulting service provision. We identify the decision-making points and the data recorded about service users throughout the workflow. Data are derived from the local government social care system in Birmingham and span the years 2013–16.

Process assessment proceeds in a similar manner to the Assessments and Packages of Care return (RAP) and the Adult Social Care Combined Activity return (ASC-CAR) in NHS Digital (2014, p. 119). Related studies have explored the relationship and proportion of service provision for children under the age of five and their safeguarding systems (Bilson and Martin, 2016). 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 (O’Sullivan, 2011); correlational analysis has been applied to explore the relationship between service demand, failure demand and workforce stability (Hood *et al.*, 2016).

## Birmingham and its city council

Birmingham City Council (BCC) 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 (ONS, 2015). Birmingham is managed through division into ten council constituencies and forty electoral wards (see Figure 1). BCC is the largest local authority in Western Europe and expenditure in 2016–17 was £3.094 billion, of which £805 million was spent on services for people. Birmingham is a young and diverse city; the population of adults and older adults is reported to have increased by more than 10 per cent since 2013 (ONS, 2015) and now accounts for more than 75 per cent of the total population in the city (ONS, 2013).

## Performance of adult social care

This research has been established in the context of understanding the assessments and care paths of adult social care recipients in Birmingham.



**Figure 1:** Birmingham and its ten council constituencies and forty electoral wards

BCC commissioned this research to build evidence that would assist with assessment of demand, analysis of process and identifying opportunities for service improvement and budget reductions. The Council Business Plan 2016 (Birmingham City Council, 2016) provides 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 having access to either a Direct Payment or individual budget.

Net expenditure on adult social care for Birmingham in 2014–15 was £272.5 million, from which £202.8 million (74.4 per cent) was spent on directly providing care to citizens, buying care from other organisations and providing Direct Payments (money paid by the council to independently meet assessed care needs). Table 1 shows that the largest contributions from the £202.8 million 2014–15 budget-funded services for people aged sixty-five and over (44.2 per cent) and for those aged eighteen to sixty-four with learning disabilities (33.7 per cent).

BCC has continued to face cuts in its grants from central government. In 2014–15, Birmingham's adult social care services needed to make net

**Table 1** Total adult social care net expenditure of 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

savings of over £32 million—approximately 16 per cent of its annual spend (Birmingham City Council, 2016). This research focuses specifically on adult social care from the initiation of the request of the service. In particular, we sought to:

- understand the data-creation and -collection process and the structure of social care, including different phases of the assessment process;
- understand the data flow of the process for adult social care service users;
- identify possible areas for further investigation, with a particular focus on underpinning future processes that would allow the council to meet its savings targets.

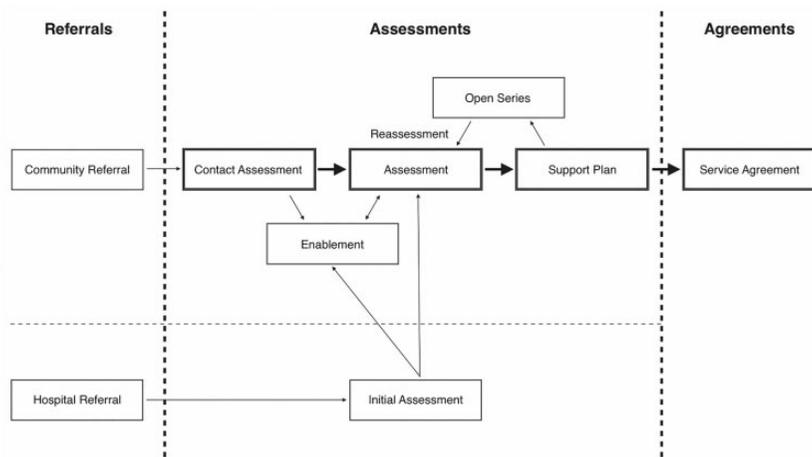
The research revealed significant challenges with the assessment data, highlighting issues in data capture between referral and service delivery. Given that these data underpin future strategic decision making, these findings were considered to offer substantial new insight.

## Assessment process

To understand the assessment processes, we study the data flow as it is captured for a client from the initial request for social care support to the council. There are two principal routes into social care in Birmingham: (i) community referrals and (ii) hospital referrals. The data in this research show a 65:35 ratio of people receiving care through the community against hospital referrals. The referral process is then supported by a number of linked processes, as seen in Figure 2.

## Referrals

A community referral can be generated by the service users themselves, a family member, a general practitioner or others with concerns for the welfare of an individual. A hospital referral, on the other hand, will require input from a relevant social care assessor employed by the authority to make a primary social care need decision for that individual.



**Figure 2:** High-level assessment process

Additional information from the social worker may be added to complete the referral process:

- *Community Referral (CR)*: referrers have an opportunity to discuss the referral with a qualified social worker to determine the next step;
- *Hospital Referral (HR)*: referral is created as part of the discharge plan for an inpatient, categorised as (i) a hospital referral for a new client or (ii) a hospital referral for an existing client who is currently receiving a service but has now been admitted to hospital.

## Assessments

The recording of the assessment process in BCC's CareFirst system consists of six sub-processes:

- *Contact Assessment (CA)*: a screening-level assessment to provide information and record clients' basic information before transferring the case for further consideration;
- *Initial Assessment (IA)*: creating a concise assessment, carried out twenty-four to forty-eight hours after receipt of the referral;
- *Assessment (AS)*: a record of the discussion between the eligible client and the social worker to determine the level of the individual's needs; the focus will include the eligibility of the client and the options available to meet their needs;

- *Support Plan (SP)*: details the services that the client is eligible for, including their duration and location, based on the outcome of the assessment;
- *Enablement (ENB)*: a short-term support option with no charge, normally consisting of an intense six-week period of home support and homecare to help a client regain their independence;
- *Open Services (OS)/Reassessment (RE)*: where changing circumstances and level of need are reassessed in the SP or assessment.

## Agreements (AG)

The service agreement refers to the contract between the council and the commissioned service provider to deliver the SP.

## Adult social care eligibility

An assessment is carried out to establish whether a citizen may be eligible for social care services. During the period covered by the data, prior to April 2015, the eligibility threshold was set locally, based on the Fair Access to Care directive. New criteria came into effect in April 2015, as set out in the Care Act and its statutory guidance (Lea, 2014). The Care Act needs assessment employs a three-stage test that establishes (i) whether needs are connected with disability or illness, (ii) whether those needs prevent an individual achieving two or more outcomes, from a list that includes criteria such as managing and maintaining nutrition, being appropriately clothed and being able to care for dependent children, and (iii) whether this then impacts the individual's well-being (House of Parliament, 2014). As the data utilised in this study cover both regimes, the impact of these changes is explored further as part of the qualitative exploration of the data flow in the assessment process.

## Care service assessment and agreement data

Data used in this research are derived from structured assessment and service agreements, which are extracted from BCC's CareFirst information system.

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 note that (i) there was a change in eligibility criteria and assessment practice and (ii) systems and

processes were experiencing a period of change at that time, in preparation for and during the adoption of Care Act changes. The data subsample included over 69,147 distinct users, registered for more than 238,000 assessments and comprising eight major assessment sub-processes. Each extracted assessment consisted of sixteen associated variables.

For agreements, open and closed data for the same period were used to study the progress of individuals. The data included over 29,385 distinct people and more than 90,600 service agreement records. Each service agreement consists of twelve records (see Table 2).

We note that there will be some duplication of individuals with such categorisation, as a person may be registered for more than one assessment and agreement within a period.

The data were further filtered and focused on four core sub-processes: contact assessment, assessment, support planning and service agreement (see Table 3).

## Process completion

Each assessment-process stage should be subject to a *completion status*, reflecting the decision made during that sub-process. Our investigation of possible completion statuses has identified forty-two different options.

**Table 2** The service assessment and agreement records used in this study

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 3** Number of service records and unique individuals of the sub-process in the assessment process

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 4** The category of form of outcome and corresponding team and the samples

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

For the purposes of this research, we group the forty-two different outcomes into five categories (see Table 4).

'Proceed', 'close' and 'did not take place' are self-explanatory. 'Qualified closure' refers to an assessment process that has ended, but requires more data or denotes a subsequent assessment process following a hospital admission. Finally, 'unknown' refers to either an unknown outcome or a data-quality issue.

## Data cleansing and pre-processing

The data contained 432 service teams supporting social care across the city. The teams are mapped with team codes provided by the council; this mapping allows us to reduce the service teams to eighty-five with seven categories; this distribution will be used during the case studies (see Table 4).

Pre-processing scripts and the statistical tools in R are used, removing erroneous characters, conducting range checks and identifying missing values (Ihaka and Gentleman, 1996; R Core Team, 2013). Of the

292,343 assessments studied, 54,193 (18.53 per cent) are removed because of ‘bad data’; the majority of these involve (i) missing values, (ii) unreadable or invalid data records and/or (iii) unknown, invalid or out-of-range age entries.

We employ open-source geographical information systems to perform spatial-temporal mapping. Eastings and Northings—geographic cartesian coordinates for eastward and northward-measured distances—are transformed into latitude–longitude coordinates using the ‘rgdal’ package in R.

## Initial findings

Our analysis seeks to understand the relationship between different stages of the assessment process, from referral to agreement in the CareFirst system. We first look at the continuity and structure of the process flow (see [Figure 2](#)). This may reflect the quality of care and impact on the effectiveness of service delivery ([McCormack et al., 2008](#)), and/or reflect characteristics of and interaction with the system itself. The flow suggests a linear pattern of referrals, where each sub-stage should contain a decision that either closes the assessment or proceeds to the next stage. Analysis of the continuity of the assessment process is based on three-plus-one (agreement) sub-processes (highlighted in bold in [Figure 2](#)).

We identify the number of unique recipient records in each sub-process using the unique identifier assigned to every recipient. From the data-flow standpoint, this step might assume results would show a flow of individuals’ information through the process, either ending in a service being delivered or a record of a decision closing the assessment: we recognise that, due to the limitation of the system, ‘shortcuts’ may be made as practitioners seek to make their jobs more manageable.

The results yield interesting findings. First, there are numerous service users who appear in sub-stages without appearing in earlier stages. Second, whilst the numbers of users moving from CA to AS drops considerably (expected if the service users’ needs cannot be met), the records do not reflect the closure of assessment. Rather, many records report users requiring further assessment. Third, of the total number of unique individuals in the data-sets, only 40 per cent appear in all four sub-processes. An analysis of the flow of all recipients in the assessment process is highlighted.

We present a more detailed analysis of results through three case studies.

## Case study 1: qualitative exploration of data flow in the assessment process

We provide a qualitative exploration of data flow within and between the phases of assessment. Note that analysis only involves data from

four core sub-processes (not from HR, IA, Enablement (ENB) and Open Services (OS)/Reassessment (RE)) and that the focus is quality and flow of data, not why it is as such.

The study concentrates on three linked processes: CA to AS, AS to SP and SP to AG. To improve our understanding of each sub-process, a matrix is generated to examine the flow of data through these linked processes. Findings highlight that as many as a quarter of individual records appear in a stage but not the proceeding stage. For example, 8,350 recipients received agreements but did not have a corresponding SP. To understand the potential anomalies, we considered other sub-processes that are in place and that may account for these figures; we expand on this below.

Assessment is a complex process in which information can be recorded and obtained in several ways. We explore other possible datasets that could potentially help explain the source of individuals: (i) data from other sub-processes such as HR, IA and RE named as HIR; (ii) data from the ENB stage; and (iii) data from excluded lists. Table 5 highlights the numbers from all three sources. ENB is obtained by extracting its related records from open/closed agreement data. The excluded list refers to a CA where there are insufficient data for the council to take forward the case.

Table 6 uses information from Table 7. The records are then matched and linked using personal identity numbers to those external sources. The results show that there are still 681 (2.55 per cent of AS clients), 1,512 (6.3 per cent of SP clients) and 2,425 (8.25 per cent of AG clients)

**Table 5** Number of people involved in other non-core stages within the assessment process

Sub-process name	Number of people
Hospital Referral (HR)	22,771
Initial Assessment (IA)	15,628
Reassessment (RE)	16,344
Enablement (ENB)	9,363
Excluded List	10,773

**Table 6** Number of people who are filtered from HIR, ENB and excluded list

Link	Number of people	Excluded from			Remainder
		HIR	ENB	Excluded list	
CA to AS	3,967	3,210	43	33	681
AS to SP	8,930	7,324	42	52	1,512
SP to AG	8,350	5,172	485	268	2,425

**Table 7** Matrix of number of people who appear in a stage but not the proceeding stage

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

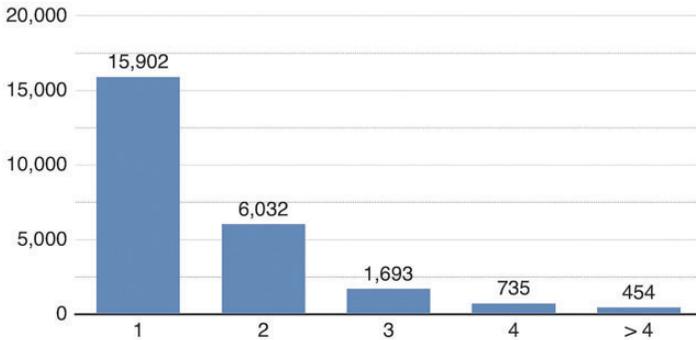
unique individuals whose information does not appear in the previous adjacent stage.

In addition to analysing the complete data-set, the matrix-base method shown in Table 7 is also applied to the data pre and post April 2015 (recognising the change in eligibility criteria at this time). Two findings were apparent: first, that the pattern of individual's data being recorded in one stage of the process but not in the preceding stage remains a feature of the recording process; second, that the data after April 2017 involve around 10,000 fewer service users, which may be a reflection of the new Care Act eligibility criteria. There is further scope to study in more detail the impact of the introduction of the 2015 Care Act on BCC's processes and data; this remains the topic of future research.

The analysis of mapping the data emphasises the complexity of data recording in assessment processes. The analysis of the complete data-set identified approximately 4,500 service users who cannot be accounted for when considering their entrance or exit from the social care process. The case study shows the fragmented nature of the data across the four-year period and the two assessment regimes. It should be recognised that this is a data-led study and therefore does not reflect the use of the system by practitioners. There are likely to be elements of the process that are not recorded or cannot be recorded easily due to system limitations and/or practical workarounds.

## Case study 2: identifying anomalies in the assessment process

We examine 27,238 unique individuals whose information is only present in CA and investigate the outcomes associated with each. This, as with Case study 1, demonstrates a significant number of cases where recorded data do not flow sequentially between and through stages. The CA sub-process represents 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.



**Figure 3:** Number of frequency of assessment taken by individuals who only appear in CA

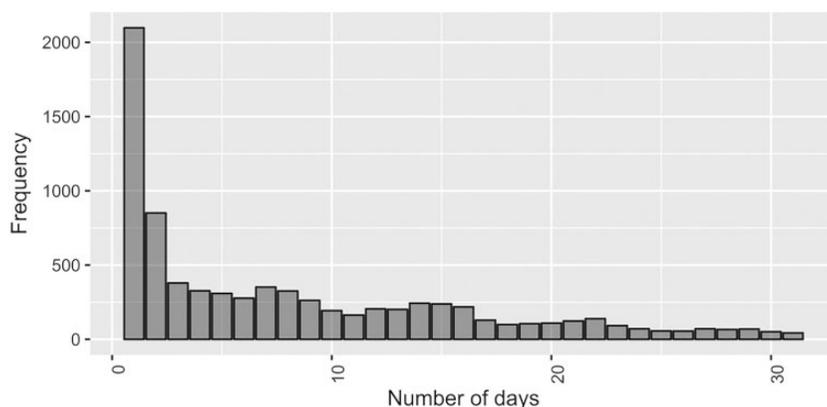
To understand how data are being recorded in the system, we consider the recorded outcomes in CA. We explore other sources that may explain the number of records in CA, including referral to enablement services or records appearing in the excluded list. The results reveal that 124 unique people are progressed to the ENB stage and, by matching people to the excluded list, we filter 2,298 individuals from the CA data. Therefore, we investigate a total of 24,816 remaining CA records.

Figure 3 reflects the number of assessments a person receives within CA. 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 2. However, the data reveal that, instead of closure (CL), 53 per cent of records highlight the need for further assessment (FA), which indicates that the record should be held for revision or progressed to AS for additional support.

The impact upon clients whose records denote FA is significant in the context of access to services, as is the ability to manage demand in an environment where savings need to be made. The absence of a recorded closure of assessment at this stage leads to questions about the reliability of service user data in the CareFirst system and also the outcomes for the service users. Furthermore, this may also reflect an unmet care need that will require management in the future.

Start and end assessment dates indicate when people register for assessment and for how long. These variables can be used to calculate the length of assessment in days (see Figure 4). 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.

The data expose a relationship between assessment duration and forms of outcome. People who are assigned to FA as an outcome



**Figure 4:** Frequency of length of provision of CA people who receive one assessment and ‘further assessment’ as outcome form

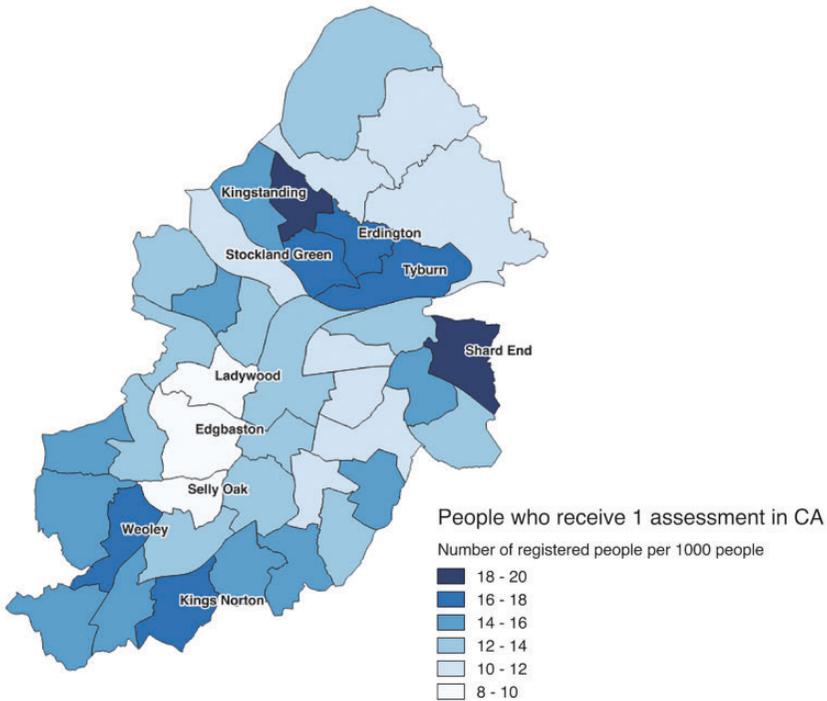
normally terminate the assessment within ten days, compared to slightly more than two weeks for those who are assigned to CL, despite being a larger proportion. The data also show that 25 per cent of people with FA as an outcome are assessed within a day—about 5 per cent higher than those from CL. The fact that the FA occurs earlier than a CL within the group is another unexpected finding from the data.

We also investigate the provision of assessments by location. Ward regions are used to display the geographical dispersal of people who receive one assessment over the period. To address low numbers of assessments per ward and a fluid population, the frequency of records per ward is normalised by the total population per ward from the Birmingham 2011 census (ONS, 2013). The colour of the area is determined by the number of people who only register for one assessment per 1,000 of the population; a darker area indicates that more people have been assessed (Figure 5). Note that this case study only includes unique individual records.

The map displays where there is only one documented response at the CA stage across the city region. A deeper analysis of the one documented response in Figure 5 allows us to explore the proportion of those responses that are either stated as CL or FA in Figure 6. The colour of the area is determined by the ratio of outcome, FA against CL per 1,000 population; a darker area indicates that more people are assigned to FA. By identifying possible locations where FA is a significant outcome recorded, it may be possible to target these areas to better understand the reasons behind these data.

### Case study 3: characteristics of completed stages

We also investigate the progress of service users through the sub-processes and the outcomes of each stage. The data show that 11,575

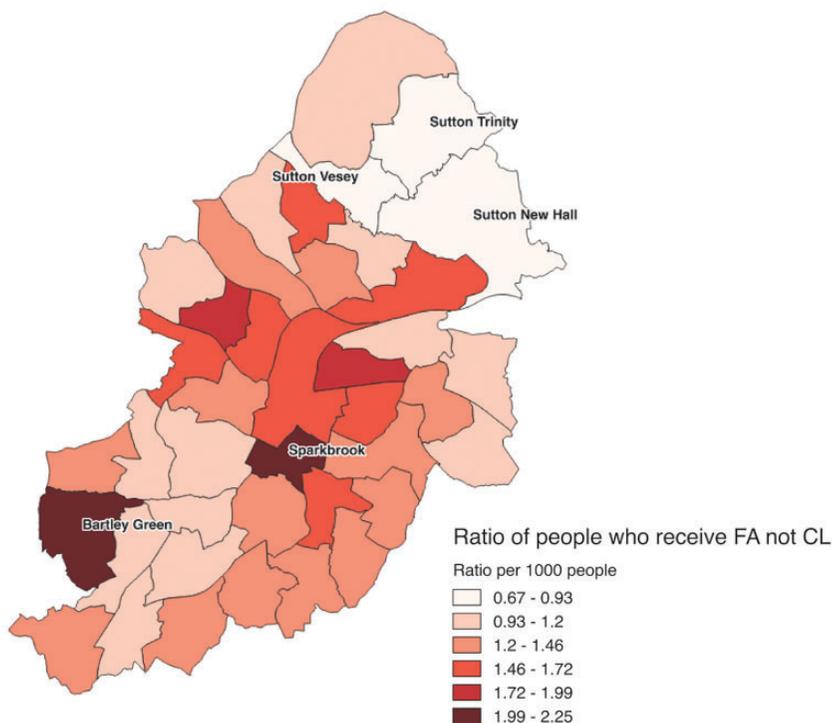


**Figure 5:** Geographical dispersal of CA people who receive one assessment across Birmingham’s ward region (per 1,000 population)

people (16.42 per cent) of a total of 70,474 successfully progress through the assessment process to receive a service. However, this only accounts for 40.57 per cent of individuals at the AG stage.

Our analysis maps the outcomes and corresponding assessment teams for all registered people in the assessment process (Table 3); Figure 7 displays these results as a matrix, matching outcome groups (rows) to assessment teams (columns), using the supporting data set out in Table 4 that determine the number of subgroups in each category. The subgroups are then ordered alphabetically (see sample at the top left sub-figure of Figure 8). Individuals whose information consists of two or more distinct outcomes and/or teams are excluded to avoid record bias; this accounts for only 0.8 per cent of all unique recipients.

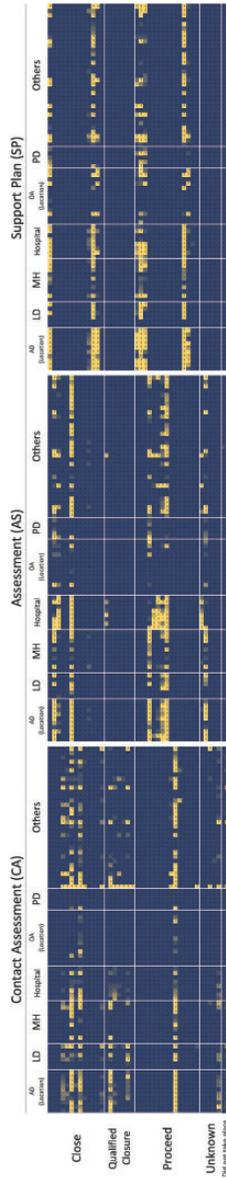
The colour indicates the magnitude of people involved in each criterion; a darker shade represents fewer people and, in contrast, the lighter shades are graded by percentile distribution—the darkest cells denote a frequency at the (lowest) 10th percentile and the brightest cells form the 95th percentile. The light-grey grid in the matrix helps to distinguish the boundary of each group and aids interpretation among the sub-processes.



**Figure 6:** Geographical dispersal ratio of CA people who receive one assessment of 'further assessment' but not 'closure' across Birmingham's ward region (per 1,000 population)

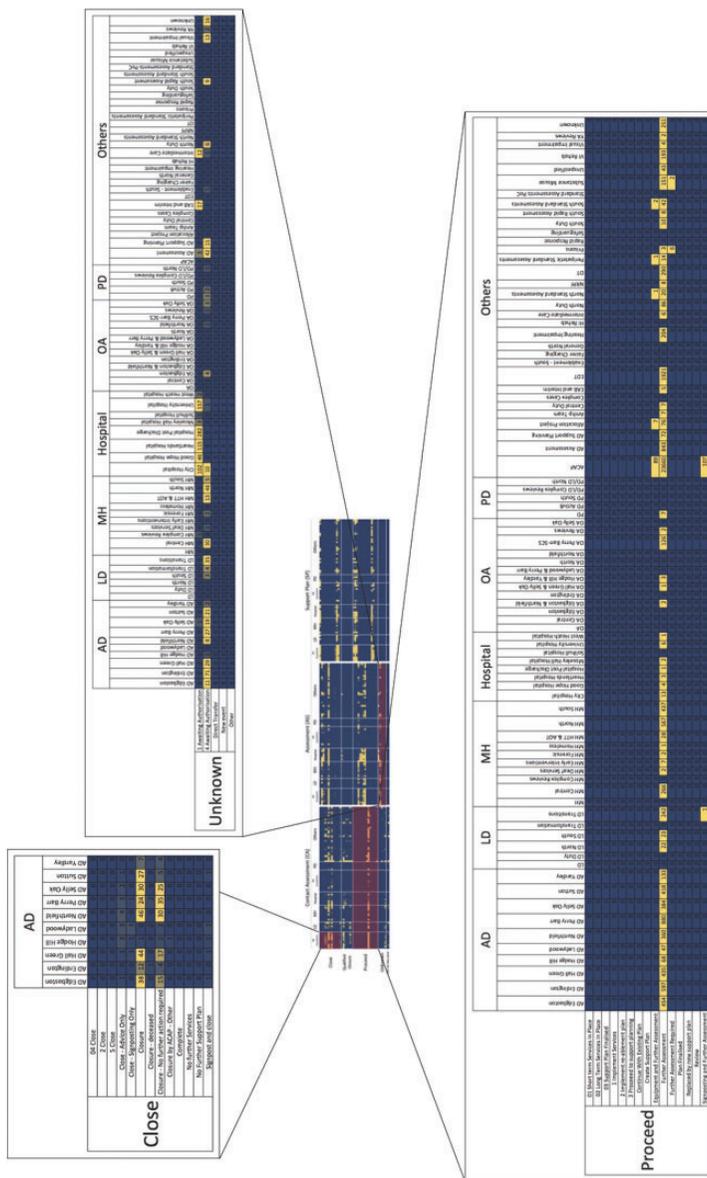
The representation of data in [Figure 8](#) allows us to focus on emerging patterns in the data at each sub-process. The top left sub-figure displays a sample of how the format and layout of the remaining matrix cells are displayed. The two key findings from the matrix are that:

- The 'proceed' outcome indicates where service users require further support from the council. The corresponding team that accounts for most of the decision making for 'FA' in CA is Adults and Communities Access Point (ACAP) (70.69 per cent), who initiate the contact assessment, collect and triage users' basic information, and assign the assessment where appropriate. FA of the outcomes also causes us to reflect on the quality and the accuracy of data collection in the assessment process by the council. Given these findings, the council might consider reducing the number of possible assessment outcomes.
- The 'unknown' outcome indicates an absence of sufficient data for an accurate determination to be made regarding the assessment. Interestingly, the matrix shows that there are significantly fewer unknown outcomes recorded in the CA process than



**Figure 7:** Matrix of form of outcomes (rows) against the corresponding teams (columns) in assessment process

there are in the AS process. In theory, none of the ‘unknown’ outcomes should appear at the AS stage. This is unusual, as the ‘unknown’ refers to key data that are unavailable and should have been considered at the CA part of the process. The data



**Figure 8:** Sample (top left) and key findings (the others) within the matrix

also show that these assignments are mostly handled by hospital-related subgroups. In contrast to the previous key finding, this potentially highlights poor nomenclature and/or miscommunication and co-ordination between social workers in different departments along the workflow from CA to AS.

Overall, the data expose that, within each outcome group, especially in ‘close’ and ‘proceed’, many subgroups are recorded using similar headings. For example, ‘plan finalised’ and ‘support plan finalised’ in the ‘proceed’ outcome have identical meanings. This adds further evidence to Case study 1 and our argument regarding the inconsistencies in the recording of outcomes in the system by practitioners, which requires further investigation by the council. The case study suggests merging outcomes and standardising terminology, both of which should go some way to ensuring better data collection across the assessment process.

This case study has sought to understand the flow of data through the assessment process and identify gaps among the sub-processes. We believe that, by taking a data-driven approach to this topic, it will lay the foundation to better data collection and analysis, upon which better planning, budget setting and financial scrutiny can be built.

## Discussion

This research 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 (or impact on) proposed financial savings.

The assessment process in [Figure 2](#) shows the complexity of the data flow for a service user from referral to agreement. 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.

The three case studies highlight 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 first study highlights 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 highlights 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 highlight a risk to the service users in that it is unclear how the assessments are completed outside of the recognised process. 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 financial analysis, this highlights a significant risk to the council achieving budgetary savings as well as their ability to plan for future demand for services.

The second study investigates 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 regard 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.

The last study considers 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 highlights the difficulty of future budget planning for the local authority.

## Limitations

Although several significant outcomes have been identified in this research, limitations are also exposed. First, the analyses rely on a single administrative data source. Other forms of assessment data could help explain the rationale behind some of the assessment decisions found in the CareFirst data. Second, whilst the data used for the analyses are considered 'good-quality', during the pre-process stage, some data records were removed because of corrupt fields. This will have some (although we believe limited) impact on the results and strength of analysis. Third, the related work is restricted to that which combines the social care assessment process with administrative data; broader studies clearly exist but, for the sake of brevity, we restrict our literature survey. Finally, the research recognises that human input into the CareFirst system is not linear in the way that is described in [Figure 2](#). The system is more than ten years old and is therefore likely to be limited in its flexibility.

We recognise that a quantitative examination of data must, ultimately, be contextualised with a qualitative examination of how social care practitioners interact with and make use of the CareFirst system. This is the subject of future research.

## Conclusions and future work

This article explores the continuity of data associated with adult social care assessment in the city of Birmingham, the UK's second largest city. We use data-analytic techniques to examine the flow of information from referral through the assessment process and the resulting service provision between 2013 and 2016, using data from the local authority's internal CareFirst system. In a similar manner to the rate-limiting techniques of Cooper *et al.* (2011), we identify the decision-making points throughout the process, to understand and analyse the service users' data. The paper presents three case studies 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.

Future work will consider human interaction with the CareFirst system from both an assessment practitioner and service users' perspective. We hope that, by doing this, we can expose real-life interaction and process flow that reflects a more temporal picture of data collection and decision-making processes. This may go some way to accounting for the anomalies that we have discovered in our work thus far.

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