

Accountability and neglect in UK social care innovation

Cian O'Donovan ¹

Department of Science and Technology Studies

University College London, United Kingdom

November 2020

Abstract

Accountability structures in social care are critical. They facilitate democratic decision-making, responsibility and the equitable distribution of benefits. This study examines how innovation and technology is implicated in such structures.

In the UK, innovation and technology researchers have predominantly imagined care as service provision, with accountability structured through paternalistic and technocratic configurations of people, materials and knowledge. Aligning with incumbent policy and interests, these structures neglect significant groups of actors and issues, with implications for ongoing vulnerabilities in the sector. This study empirically identifies diverse possibilities for how innovation could reconfigure accountability structures in inclusive, participative and less neglectful ways.

Key words

Social care policy; innovation; technology; accountability

1. Introduction – accountability in social care

Technology's promises pervade policy responses to Covid-19. Technologists, funders and politicians continue to propose and finance innovation as solutions to vulnerabilities in the social care sector exposed by the pandemic (Dunn *et al.*, 2020; Gigler, 2020; Knowledge Transfer Network, 2020). This is nothing new; technological innovation has long been championed as a palliative to vulnerabilities in care sectors, and more broadly across public policy domains (Pfothenauer *et al.*, 2019). Yet when it comes to initial responses to Covid-19, technology has been implicated in significant policy failures in the UK and elsewhere¹. Technology's promoters are not holding up their side of the bargain.

In so far as they can be called strategic, government and private sector responses can be characterised as attending to the speed and scale of innovation over its direction (Stirling, O'Donovan and Ayre, 2018). This is exemplified in the rhetorics of testing where success is measured narrowly in terms of scale-up of tests-per-day. Significantly less attention has been given by these actors to decisions of who benefits from such innovation, how benefits are distributed across society, and the underlying political choices of who decides and who is accountable for those decisions. Choices about who is prioritised for example, who is tested, and who is *not* tested.

Structures of accountability within the social care sector are critical sites of concern. In this paper I address these concerns by asking: *how has accountability in social care been structured and imagined in technology and innovation research?*

Accountability directs our attention to the fact or condition of being accountable. Analytically, it is usefully appraised in the adjectival form; to hold someone, or some group, accountable is to trace this relationship and make it operational. The job of the analyst then is to open up for analysis these relationships of responsibility and power. In this paper I do just that. I illustrate how science, technology and innovation are implicated in relationships of accountability, and

¹ Corresponding author: Cian O'Donovan, c.o'donovan@ucl.ac.uk

how they are structured and configured in the social care sector through practices and outputs of innovation.

In the field of innovation studies, accountability has traditionally been understood as an issue for those concerned with the consequences of science and technology (Genus and Stirling, 2018). In recent decades, discussions of accountability in research and innovation policy have tended to turn on anticipatory technological decision-making and inclusive deliberation. In response to emerging technologies such as synthetic biology, genetically modified organisms and more recently artificial intelligence and robotics, the focus of research policy tends to be the creation or strengthening of accountability structures that are capable of dealing with such technologies *upstream* within the research system or *downstream* in markets. The proliferation of responsible innovation programmes and ethics frameworks are examples of instruments designed to govern emerging technologies (Boden *et al.*, 2017; Macnaghten, 2020).

Technology and innovation also configure existing structures of accountability in more mundane ways. Technologies can open up bureaucratic administrations to broader forms of public oversight or even participation, strengthening relations of accountability between publics, public administrators and public representatives. Assessment methodologies that rely on audits and data production are designed to do just this, through star-ratings, league tables and alert systems for example (Cutler and Waine, 2003). But technology is also implicated in systems which allow powerful actors evade accountability. For example, by obfuscating responsibility through the imposition of data or algorithmic decision making, in turn hiding complexity and seemingly de-politicising decision making (Noble, 2018).

Such socio-material accountability structures arise from often complex arrangements of people, technology, knowledge, data and infrastructures. Indeed, this latter case, historically excluded from studies of accountability in innovation, adds significant novelty to this study.

Science and Technology Studies scholars, sociologists of health and infection and critical design thinkers have usefully conceptualised ways to imagine, build and perform socio-material arrangements in care sectors - what they call infrastructures of care (Langstrup, 2013; Weiner and Will, 2018). These concepts highlight the socio-material arrangements involved in establishing care as a set of relations, networks and obligations embedded in communities and constituent of their values.

These concepts have diagnostic value – they can aid the assessment of how care is configured in places outside of acute settings such as hospitals. But they also have critical value. They draw attention to links between different objects and spaces that are integral to practices, beyond a narrow focus, say on emerging technology alone - often the flag pole element in research dedicated to innovation in social care (Prescott and Caleb-Solly, 2017).

These concepts show us that care is not an automatic output of systems or infrastructures, but rather is situated within and amongst their constituent parts, and, crucially, is predicated on structures of accountability (Light and Seravalli, 2019). Accountability structures, like other sets of human and technical relations, are not given. They may be designed to narrowly emphasise centralised decision making and control, or conversely distributed widely, emphasising processes of democracy and collaboration in decision making. This is not to make a normative claim over any given structure, rather to note that the social (organisational structures, reporting rules, priorities) and material and technological (measuring tools, methods, statistics) aspects of accountability matter, and either explicitly or implicitly are often subject to reconfiguration following the imposition of new technologies and other kinds of innovation.

Yet this renewed intellectual attention on infrastructures of care remains at odds with dominant policy framings in the UK. Here, innovation in social care continues to be framed under a *service logic*. Social care as a finite resource to be administered to recipients (Berridge *et al.*,

2014; Mostaghel, 2016). In a budgetary era when Keynesian infrastructure spending is back, this framing has implications for the allocation of public spending to care sectors. Investment in national infrastructure for example carries the kind of rhetorical and economic heft that the shoring up of localised care services do not. And so, at stake in this study of how accountability is structured is first issues of resilience and vulnerability within care sectors – questions of who or what is neglected and who decides. And second, the salience of discursive framings of care that lend themselves to broader economic and political commitments to appropriate funding.

2. Materials and methods

In answering the research question, I analysed evidence from a series of research tasks conducted between 2018 and 2020 in the robotics and social care sector using situational analysis (Clarke, 2009). Evidence was produced through observing researchers and their innovation practices; interviews with researchers, technologists, care home operators and related experts; stakeholder workshops with roboticists; and reviews of academic and policy literature.

In order to understand how accountability in social care is imagined at the level of research projects across the UK research councils, a study of research investments was carried out using observations from project abstracts. This built on recent methodological innovation in the study of situations using computational data (Marres, 2020). 127 projects relating to social care were identified in the UKRI's projects database, Gateway to Researchⁱⁱ.

Project abstracts are well suited to the task. Typically, each abstract describes a prospective research situation. This description serves as a promise to carry out certain methods and answer certain research questions, and also to perform research in a certain way, matching a particular vision of how the social and technological world is and should be (Jasanoff and Kim, 2015). Project abstracts were systematically mapped to locate and analyse discursive arrangements of innovation, technology, and socio-material structures of accountability. These arrangements were categorised, and categories reduced until coherence could no longer be sustained.

Three aspects of these situations are relevant to answering the research question. First, studying how accountability is imagined by researchers. This reveals something about the imprint of power on a situation and how subjects and objects are related within that situation. Second, how social care is described. For example, is care seen as a service, an arrangement of market players, an obligation, an ethical concern or something else entirely. Third, how technology and innovation is imagined within such a situation and what is seen to make a difference.

Finally, I introduce two critical case studies cases (Flyvbjerg, 2006). The first, on data and artificial intelligence is strategically chosen to illustrate how technology reinforces incumbent accountability structures. The second, on assistive living robotics, shows participative research practices that attempt to broaden-out accountability.

3. The emergence of Covid-19 – revealing accountability and neglect in social care

In the initial months of the Covid-19 crisis, 'Protect the NHS' was the political choice not only of an on-brand slogan, but of a national strategy (Chambers, 2020). The operating logic of this strategy was centralised command and control. Yet a combination of inadequate political planning and systemic infrastructure and service failings undermined efforts to adapt to the crisis in care sectors and especially in elderly care. Guidance from the national government was insufficient and late, arriving only on March 13th (Department of Health and Social Care, 2020d). Personal protective equipment was subject to supply and distribution problems (Hignett, 2020). The government made a series of incremental financial commitments for the sector. But the processes of distributing money through local authorities to where it was needed was slow (Department of Health and Social Care, 2020c). This prevented many homes increasing their most prevalent and adaptable resources, human carers. The UK government

decision to give-up on Covid-19 testing outside of hospital settings meant staff and residents did not and could not know who was infected. And testing protocol for care homes was not re-established until early May (Department of Health and Social Care, 2020e).

These issues were exacerbated by the directive from the government to empty hospitals of old people for re-housing in care homes (Department of Health and Social Care, 2020b; National Audit Office, 2020, p. 47). As hospitals were cleared ahead of the expected Covid-19 wave, non-acute elderly patients were transferred ‘into the community’ whether they had Covid-19 or not. Jane Deith reports on the BBC’s *File on 4* (Deith, 2020) that despite government claims that “decisions to push out non-tested patients into care homes were made by middle ranking NHS managers, that was not the case. It was deliberate policy.” Official guidelines even mention a “*Capacity Tracker* as a universal mechanism across the country to report bed vacancies and help manage demand during this incident” (Department of Health and Social Care, 2020a). This is remarkable. The primary unit the government was using to monitor and account for care in homes was not based on measures of care, health or even Covid-19 infection, but one of instrumental supply of beds.

Tracing structures of accountability in care sectors and how they worked during these early months of the Covid-19 crisis is a difficult task. Rather than accountability, the dominant feature of the period seems to be neglect. Neglect of the interests of residents and users of care services, neglect of the staff and families who provide that care, crucially neglect of local and situated knowledge that might make a difference in individual situations. Moreover, this neglect was structured by inefficient and insufficient data, finance, communications and technological resource.

And so, in the following sections I show how these conditions of neglect do not indicate merely a deficiency of innovation in a moment of crisis, but rather are contingent on policy and political decisions, market arrangements and technological interventions over many years.

4. The direction of innovation and technology development in social care

Remarkable historical improvements in health and well-being – at least for some – owe much to science, technology and innovation (Blume and Geesink, 2000). However, not all consequences of research and innovation are positive. Nor do any benefits unfold automatically – especially if they are to be fairly distributed to those who need them most (Stirling, O’Donovan and Ayre, 2018). Innovation is the practice of developing and implementing new ideas (Freeman and Soete, 1997). It is a form of conversation between needs and possibilities of designers, users and society, often contested and always political (Stilgoe, 2020). And so, understanding how innovation in its social, technological and institutional forms, has imagined and has been directed to address issues such as distribution of benefits, costs of implementation, or configuring of accountability within care systems is a fundamental challenge in answering the research question.

4.1 Policy and politics

Let’s begin with the institutional context in which decisions about what to innovate are taken. In the UK, care that is administered outside of hospitals takes place ‘in the community’ - a strangely singular phrase for what is in fact a patchwork of communities, collectives and charities, around 19,000 ‘providers’ in all (The King’s Fund, 2019). In 2005 UK financing of long-term care as a percentage of GDP was broadly comparable with other advanced welfare states such as Germany, Australia and, Canada – although well-being outcomes lagged even then (OECD, 2005). In the 15 years since, spending in real-terms has fallen, while the population has risen (Age UK, 2019a). By the end of 2019, just before the pandemic hit, it was clear that resources such as finance, knowledge and people’s time were insufficiently available

across care sectors, and adequate finance was not getting through to where it is needed most (National Audit Office, 2018; Blakeley and Quilter-Pinner, 2019).

One explanation is that the organisation of responsibilities within the care sector is highly fragmented (Care Quality Commission, 2018). Structures of accountability that would ground responsibilities locally are not coupled with adequate flows of finance. State funding is a mish-mash of entitlements, needs based assessment, and local arrangements controlling access and levels of provision which is not supported by national commitments to adequate funding and good governance (Ranci and Pavolini, 2013).

Untangling the historic threads that have led to this situation is not straightforward. There is no single policy, funding or service stream that is widely understood as ‘long-term care’. In government, Labour, the Conservatives and Liberal Democrats have found substantive reform either impossible or undesirable. Instead, their policies have pursued the creation of quasi-markets and followed a health care logic of *patient choice* (Glendinning, 2017; Baxter, Heavey and Birks, 2020). These policies have been pursued consistently over the last three decades by all governments. This purposeful and systemic fragmentation of funding through local government, the NHS and individuals themselves has led to a significant accountability deficit (Shakespeare, Stöckl and Porter, 2018).

In summary, innovation in the regulation of markets and choices imposed in pursuit of, for example, new public management, is a substantive factor in configuring the sector that has been left so vulnerable to crises.

4.2. How innovation and technology researchers imagine accountability

So what is the role of research in innovation and technology in UK care sectors? In the UK, public investment in research is generally channelled through *UK Research and Innovation* (UKRI), and, prior to its establishment in 2018, its constituent research councils and funding agencies. In recent years, where social care technology and research has been prioritised in major funding initiatives, it has been as a recipient sector for the *Strategic Priorities Fund*, part of the UK’s *National Productivity Investment Fund*, a programme designed to boost economic productivity (UKRI, 2020). In the *Industrial Strategies Challenge Fund* for example ‘Healthy Ageing’ is a flagpole issue area. At the level of research council strategy however considerations of accountability in the sector are secondary. Within these frameworks, the social care sector is understood narrowly as something of a container, to be filled with undifferentiated innovation, the purpose of which is to boost economic output.

In order to understand the picture outside of these strategic funds, and at the level of research projects across the UK research councils, 127 projects relating to social care were identified in the UKRI’s projects database, *Gateway to Research*, representing a total funding of £111,715,022 from 2006 to 2019. The search protocol was designed to capture projects that explicitly address innovation or technology in their project documentation. Table 1 shows the distribution of projects and funding across research agencies from 2006 to the end of 2019, and the relative distribution of funding on a project basis is illustrated in Figure 1.

Table 1. Distribution of projects and funding in social care research across UK research agencies (2006-19)

Agency	Projects	Funding value (£)
AHRC	12	2,379,175
BBSRC	1	221,357
EPSRC	27	47,680,830
ESRC	39	31,933,346

Innovate UK	39	26,890,647
MRC	8	4,917,896
NERC	1	726,905

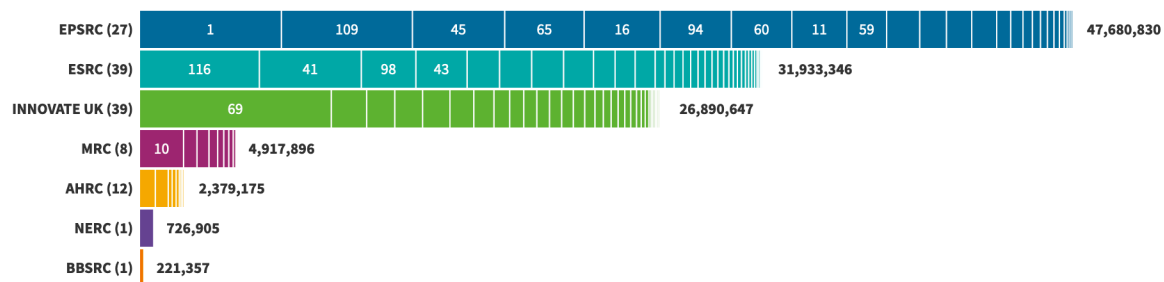


Figure 1. Distribution of projects and funding in social care research across UK research agencies (2006-19). Numbers in boxes: research project codes referenced in appendix. Left hand side labels: funder (number of projects). Right hand side labels: net funding per agency (£).

These projects range in funding and duration from one-off sandpits, conferences and seminar series to major 5-8 million-pound investments lasting up to five years with some centres for doctoral training funded for longer still. The 15 largest projects by funding account for 60% of the total funds. In some projects, social care is the central focus of the proposed research. Whilst in others, it is sub-domain of a larger problem set, or used in a justificatory sense, where beneficial future knowledge spillovers are promised.

How researchers imagine and understand social care innovation in their research

Using a situated analysis approach (Clarke, 2009), I mapped each research site, analytically creating a set of situational maps. Addressing the research question meant assessing what they revealed about the discursive arrangement of i) understandings of social care, and ii) how technology and innovation was implicated in accountability structures, or not. Put another way, what exactly do researchers understand as social care, and what kind of accountability structures do these projects imagine technology existing within.

Coding project documentation revealed four distinct discursive arrangements of social care and accountability, visible in 111 of 127 project abstracts. These are outlined in Table 2. The dominant discursive arrangement was that of social care as *service provision*. Care was understood as a resource to be distributed by professionals, usually, but not exclusively, through market arrangements. A typical project here is *Innovative Technology for Healthcare Delivery - The MIMIT: CIMIT Collaboration* (project 4, supplemental data) which promises to develop technology for expert users engaged in the delivery of services in Manchester. This understanding of social care most closely matches the incumbent position found in contemporary government and regulator policy literature discussed above.

Table 2. Understandings of social care across 127 project abstracts

social care as...	Projects	% of funding
service provision	52	49%
infrastructure (techno-deterministic)	32	23%
situated	23	8%
relational	12	3%

unresolved 8 18%

Techno-deterministic understandings of care took care to be directly attributable, at least in part, to the introduction or maintenance of technology within a system of care. An example project is *How Can Smart Home Data and Systems Improve Assisted Living Services* (28). These understandings took technology and innovation to be an unquestionable good - challenges of innovation in these projects included increasing acceptability amongst users and ensuring rapid technology roll-out. Unsurprisingly, EPSRC and Innovate UK funded projects are over-represented in this group compared with the corpus.

Situated understandings of social care tended to recognise socio-material complexities of care. Social care was understood in terms of both market-based provision, and as emergent from community settings including diverse knowledge and built infrastructure. ESRC and AHRC projects are over-represented here. Participatory methods and interdisciplinary research design were common amongst these projects. As they were with *relational* understandings of social care, which stressed human-to-human networks and communities enrolled in care (as opposed to care literally situated within communities). The relatively small number of projects categorised in this way focussed on issues like informal carers, empowerment of users and developing care practices.

These categories, emergent from the data, are not ideal types and are deliberately under-theorised at this point. Some overlap exists between them – in particular between techno-deterministic understandings of social care and service provision. But despite this, it should be clear from this brief overview that considerable diversity exists in how social care is understood and ultimately researched, although the distribution of these understandings is far from even. Moreover, as illustrated in Figure 2, there is also diversity evident within research portfolios of individual research councils. And yet this diversity tends to be absent from policy level discussions.

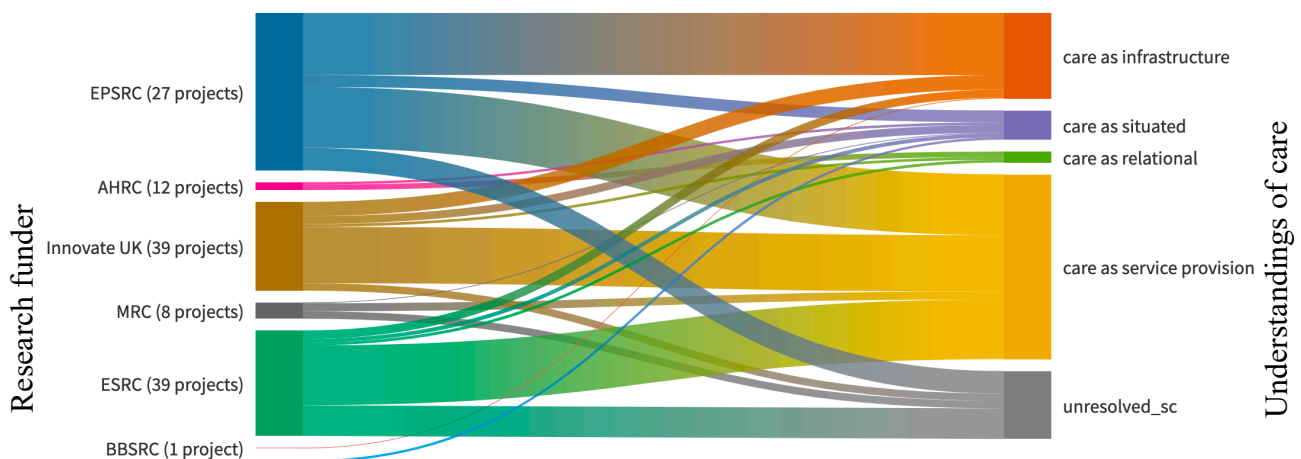


Figure 2. Mapping UK research council projects (left of figure, weighted by budget allocation) to understandings of care (right of figure) located within individual project documentation for 127 UKRI research projects.

How accountability is situated in research

Representations of accountability were determinable for 87 of 127 projects. Three distinct representations were identified and are listed in Table 3. Again, these are emergent from the data and some overlap exists.

Paternalistic representations are those projects in which agency to make substantive decisions about the provision of care is in some sense restricted. For example, limited to elite political

actors or those with expert knowledge. *Technocratic* representations are somewhat similar, however in these cases accountability is understood to be embedded in technological and administrative apparatus and systems rather than residing with particular people. Technology provides care when it contributes efficiencies of action, data and knowledge to these systems. Projects that promised to enhance care services through advance data methods, by liberating and connecting data ‘stuck’ in case notes or legacy administrative systems or creating data efficiencies featured significantly here.

Table 3. Structures of accountability in social care across 127 project abstracts

Accountability as...	invoked Projects	% of funding
paternalistic	42	39%
technocratic	29	25%
collective	21	7%
unresolved	35	28%

18 projects featured discursive arrangements of *collective accountability*, where accountability was emergent from participative innovation practices and collective action. Innovation in these projects sought to co-produce care services with people usually excluded from innovation processes (projects 33 and 25); establish convivial relations amongst communities and infrastructures (89, 103, 104, 118); empower individuals through user-centred understandings of their environment (75); and build human capabilities (14, 25, 105). Remarkably, in the 127 projects identified, only in one did researchers explicitly state the goal of enhancing well-being and cultivating capabilities in carers rather than in those cared for (30).

Again, these kinds of accountability structures are not ideal types, and some overlap was observed, particularly between *paternalistic* and *technocratic* categories. In both of these categories, accountability and decision-making agency tended to be constrained to select actors and networks. Conversely, although relatively marginal in the corpus, *collective* understandings privileged the broadening-out of participation in care practices and situated accountability and responsibility at multiple levels of governance, including communities. In 32 research projects, it was not possible to classify understandings of proposed or existing accountability structures. In some cases it may have been that this was not considered by researchers, in others, the space available to document the project may have been insufficient. Regardless, this absence is notable, after all, research councils in recent years have made some efforts to address issues such as responsibility in innovation, of which accountability is a major component.

The role of innovation and technology in social care research

Overall, what is apparent from this pilot study is that structures of accountability are more homogenous than understandings of care. Moreover, when mapped, co-occurrences of *understandings of care* and *structures of accountability* in individual projects take the form of a diverse set of relations. This is perhaps best understood with the aid of a visualisation of these co-occurrence relations in Figure 3. Incidences of *Understandings of care* are aggregated for each category on the left, weighted by project budget. These are mapped to *structures of accountability on the right*, again per project and aggregated by category.

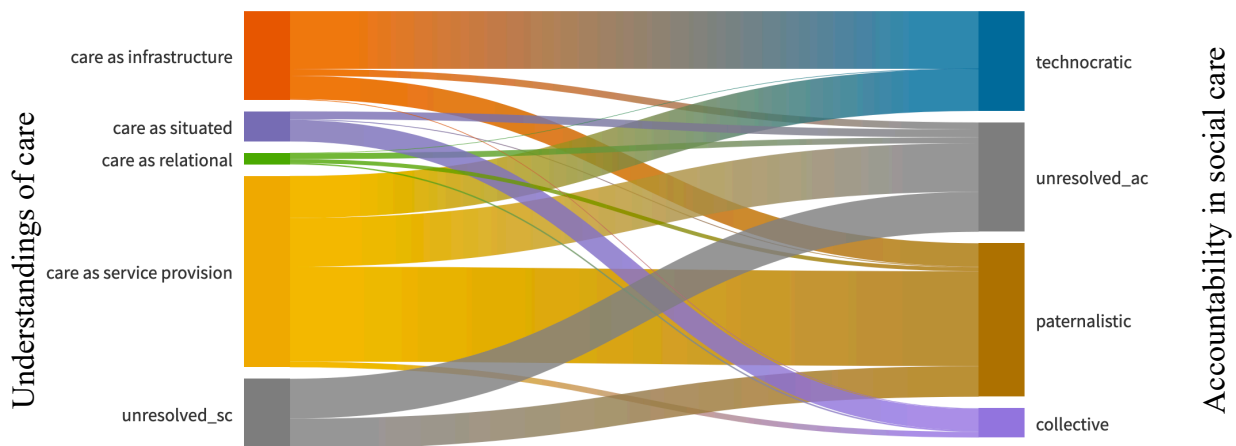


Figure 3. Visualising co-occurrences of *understandings of care* (left) with *structures of accountability* (right) in 127 UKRI research projects.

What's evident in Figure 3, for example, is that approximately half of the projects that understand social care as a form of *service provision*, also represent accountability in the sector as *paternalistic*. Remember, these are sets of co-occurrence relations, they do not indicate that forms of accountability have a dependant relationship with how care is imagined by researchers or funders or civil servants. Rather, what Figure 3 reveals is that for a given kind of *understanding of care*, the possibility of imagining accountability is not foreclosed, more than one possibility exists.

Yet despite this possibility of diverse ways of imagining, and ultimately structuring accountability, we see in the corpus of projects dominant ways of understanding accountability that align with incumbent policy and actor orientations in the sector. At the level of research council portfolios, innovation and technology researchers are reproducing incumbent framings of accountability structures.

5. Innovation in practice

So how, if at all, is accountability structured in the practices and outputs of research? The following cases are illustrative of challenges and potentials for restructuring and redirecting the processes and outcomes of innovation for care.

5.1 Case 1. Data and advanced analytic techniques in social care

The corpus of UKRI projects includes more than 20 projects which aimed to use data to address perceived knowledge deficits, economic and data efficiencies and a range of predictive and evaluative methods to enhance care. Typically, data is imagined as a solution to problems of efficiencies and monitoring. Indeed, one factor in explaining the vulnerability of the social care sector is the lack of data about the degree and distribution of system deficiencies at the sector level (National Audit Office, 2020, p. 42). According think-tank dotEveryone (Cory, 2019):

“Insufficient data is collected on the areas that matter most, including the outcomes for people who receive care. This fragmentation means it is not possible to understand what is happening across the social-care sector and inside the systems it’s made up of. Currently neglected is data that reveal the large disparity in per capita funding between areas.”

The fragmentation that exists in the governance of social care is in part structured through data infrastructures it seems. In other words, sufficient data that would help locate and reveal vulnerabilities simply does not exist. Furthermore, the retrenchment of data collection has sustained inequalities and neglect within the social care sector. Given this retrenchment has

been predicated on budgetary choices and financial savings, this systematic data neglect is at least in part the result of political choice.

At first glance the aims of these data focussed projects seem to address the structured neglect identified in Section 3. Yet in some cases, data that *are* being produced are also implicated in neglect. The *Adult Social Care Outcomes Framework*, for example, is used to “measure how well care and support services achieve the outcomes that matter most to people” (NHS Digital, 2018). The ASCOF was established to justify a market governance regime - the net result of which is to assure regulators that the provision of care is being measured, and in being measured can be controlled.

This is to neglect important features of how care is practiced and experienced; how collaborative working improves the outcomes of older people in care for example (Cory, 2019). Moreover, because the framework reports on population level surveys and aggregated indicators, it reports the average experience of social care in the UK. Yet no individual experiences care at the mean. At stake here are vulnerabilities which occur at the margins, where care is insufficient or absent entirely. Arguably then, data frameworks like the ASCOF do more to obfuscate than make accountable.

The point here is that big data and associated analysis techniques such as machine learning and other artificial intelligence technologies offer solutions to care as much in how they are configured (what real world practices and outcomes they measure, and what kind of statistical models they employ) as in the quantity of statistical inputs and outputs they process. In short, collecting and processing more data is not sufficient to address neglect, and can have negative impact on opening up structures of accountability to democratic scrutiny.

Furthermore, these technologies require ongoing maintenance and indeed care of their own. In a recent House of Lords Technology Committee hearing, Stuart Butterfield of technology firm Canary Care, drew attention to operational and maintenance issues relating to data systems at user and community levels (Science and Technology Select Committee, 2020):

“One of the big issues surrounding these kinds of systems: someone has to monitor them, someone has to look at the data and do something about it. If an alert goes off, someone has to respond. Who is that? GPs typically do not want to get involved in that kind of thing. [...] We have tried putting those systems in so that we can keep them away from the GP, but someone still has to monitor them.”

Mr. Butterfield’s point: these technologies require ongoing maintenance, skills and capabilities to manage and interpret data – aspects of social care infrastructure that are often overlooked in narrowly targeted research projects. And technologies that can, in their roll-out, actually increase operational and financial burdens on already stretched local government budgets.

Finally, in recent years, civil society groups and critical scholars have raised serious concerns about societal impacts of these kinds of technologies. Bias in algorithms, increasing inequality, deficiencies in accountability, threats to democracy and the entrenchment of systemic racism feature (Benjamin, 2016; O’Neil, 2016; Noble, 2018; Whittaker, M., Crawford, K., Dobbe, 2018). Notably for this discussion, these issues are particularly prevalent in highly institutionalised settings (Benjamin, 2019; Eubanks, 2019) and disproportionately effect black and minority ethnic people, people who are more vulnerable to Covid-19 (HM Government, 2020). Despite attention to ethics and responsible innovation from the EPSRC and others (Boden *et al.*, 2017; Macnaghten, 2020), these issues remain backgrounded in the discursive arrangements of accountability and care in individual projects as evidenced in Section 4.

5.2 Case 2: Practices of innovation for social care in robotics research

Innovation in robotics for health and social care has been increasingly promoted in funding programmes in the UK and Europe (InnovateUK, 2013; Khaksar *et al.*, 2016; Parliamentary

Office of Science & Technology, 2018). Even before Covid-19, a discursive framing of *crisis* was driving this research. Ageing populations, insufficient finance in health and social care budgets and recently in the UK, a Brexit induced shortage of low-cost health care workers unwilling or unable to come and look after Britain's elderly are all presented as rationales for urgent innovation (Prescott and Caleb-Solly, 2017) despite concerns about societal risk analogous to those discussed about data (Sparrow, 2016, 2020).

Assistive living robotics (ALR) is one set of technologies that has received policy and funding support for use in averting people's early move into more institutionalized or acute care (Gallistl and Wanka, 2019). ALR research involves understanding how people and robots can interact "intuitively, safely and effectively" (Caleb-Solly, 2016) and combines mechanisms of behaviour modification, human robotics interfaces, surveillance technologies and data analysis such as machine learning techniques.

Yet innovation in ALR faces a number of challenges in integrating complex technologies into even more complex social and physical settings - even ones as relatively stable as care homes. (Buhalis and Darcy, 2010). Some of these challenges are technical – such as the limited abilities of robots and algorithms to interpret unforeseen situations and complex environments, even relatively sedate places like care homes. Other challenges are social. Challenges relating to the complexity of care-related needs of people makes it difficult for assistive technology to stay useful over time, as people's needs change. Socio-economic challenges such as social isolation, ill health and poverty (Age UK, 2019b) which mean people who most need assistance are those least likely to gain access to research, design and testing environments.

The implications of these challenges are two-fold: 1) Design processes which exclude the needs, wants and values of the most marginalised people further exacerbate neglect (Spanakis *et al.*, 2016). 2) Because it's often easier to adapt people and environments to robots and not the other way around, robotics have a tendency to objectify the very people that are under care (Sharkey and Sharkey, 2012). The challenge for researchers and funders is to avoid the drive for independent living resulting merely in the structuring of new dependencies and risks of neglect mentioned in the previous section.

Acknowledging these concerns, an interdisciplinary group of roboticists at Bristol Robotics Laboratory are producing technologies which are socially situated. That is, designed to work and respond to their institutional and material contexts. In a recent workshop, BRL's Praminda Caleb-Solly explained that the challenge of ALR is to enhance people's well-being across a range of dimensions, to

"address unmet social needs, to add value, and to bring joy".ⁱⁱⁱ

Roboticists at BRL and elsewhere increasingly use open living labs in facilitating research methodologies for doing innovation together with different kinds of end-users (Ballon, Pierson and Delaere, 2005). This means designing and testing robots along with the infrastructures they rely on so that they will be acceptable and even enjoyable to use as-well as making efforts to ensure technologies meet ethical and cultural criteria as decided by users and care-givers themselves. In determining and addressing these criteria, the research progresses through technological advances as well as innovation in interdisciplinary methods.

But even the most porous open living lab can't fully address acute social exclusions. The strategy of researchers at BRL to introduce robotics into social care sectors that might meet these needs requires that roboticists partner with actors in those sectors; people in need of care, their formal and informal carers, healthcare and service providers, clinicians and third sector organisations. At BRL, some researchers are trialling new ways to work with community organisations and city councils in a six-week reablement programme that combines technologies with social interventions. The important thing for them is recognising and

responding to the complexity of care-related needs (Spanakis *et al.*, 2016) rather than focussing on technology alone.

Other roboticists at BRL are applying similar ‘co-design’ and ‘co-creation’ methods to the design of socially assistive robots for use in therapy (Winkle, Caleb-Solly, *et al.*, 2019; Winkle, Lemaignan, *et al.*, 2019). These methods draw on insights from human robotics interaction and science and technology studies to foreground participation and two-way learning between designers and end-users.

These examples acknowledge and explicitly attempt to avoid tendencies towards techno-determinism common in robotics. Roboticists seek to allow, to some extent at least, participation in the design and steering of technologies by people usually excluded from practices of innovation. And so, even within highly technical settings such as robot labs, we see the possibilities of diverse ways of addressing both the ends and means of research for social care.

6. Discussion and conclusions

In this paper I have addressed the question *how has accountability in social care historically been structured and imagined in technology and innovation research?* I have shown that accountability in social care is discursively framed by researchers in a diversity of ways. Yet despite this diversity, researchers in the majority of projects investigated reproduced framings of structuring accountability in the social care sector that align with dominant policy positions and incumbent actor interests.

Specifically care imagined as a form of *service provision*, and accountability relationships structured through *paternalistic* and *technocratic* means. Beneficiaries of innovation research have tended to be national and local government through cost efficiencies; service providers through data and technological efficiencies; and individuals narrowly imagined as end-users.

The implications of these findings is relevant for what and who is, and is not, attended to in infrastructures of care. For example, in only one of the 127 research projects assessed in Section 4 did researchers explicitly state that the focus of their project was improving conditions of carers (as opposed to the conditions of those being cared for or service providers). Carers are amongst the lowest paid workers in the UK, but during the Covid-19 crisis were amongst the highest valued. Yet they are almost entirely neglected in innovation research in the sector.

Research documentation I examined tended to neglect aspects of social care that are outside of market arrangements or service provision models. As discussed, typically neglected were professional and unwaged carers, but also families, wider communities and the social components of care infrastructures. Moreover, methods and opportunities to cultivate capabilities in the care sector that would mutually benefit neglected actors and build resilience and care capacity over time were almost entirely overlooked.

I introduced two critical cases. The first illustrated how technology reinforces incumbent accountability structures, showing how innovation in data can reduce accountability. The second offered examples of how participative research may broaden-out accountability by including in innovation people and communities often excluded.

There are implications here for those who steers the direction of publicly funded innovation and technology research: the framings, objects, subjects and direction of innovation and technology research matter. Researchers have choices in how they frame and conduct their work. Reproducing framings and that align with accountability structures that even public agencies and regulators acknowledge as flawed (as evidenced in Section 3) is at best a waste of public funds. And policy decision makers and funders have choices in how they direct innovation in the sector, and these choices impact accountability.

What kind of research policy and evaluation criteria might usefully guide these choices? At the level of technology and data, perhaps what is required then is not simply *big* data, but *thick* data (Smith, 2018), that accounts for relations and obligations of care within communities of workers, end-users, and unpaid family carers and mitigates historic neglect. Specific data technologies are going to require specific governance models (Smallman, 2019). Recent work funded by the Nuffield Foundation makes a number of useful suggestions in this regard (Whittlestone *et al.*, 2019). These might be augmented with re-invigorated evaluation criteria for research projects, trials, and procurement contracts with technology vendors. Criteria such as ensuring data infrastructure creates or add public value (Wilson *et al.*, 2020). Criteria ensuring that the redistribution of this value is done in fair and equitable ways (Savona, 2019). Criteria that ensure the processes and outcomes of collecting, maintaining and repairing these data are fair and just to communities under-represented in social care governance. And evaluation methodologies themselves might pay greater attention to diversity and researcher capabilities required for participative and accountable research (Bone *et al.*, 2019; O'Donovan, Michalec and Moon, 2020).

And so, for those responsible for making decisions in care sectors adapt to Covid-19, precaution is warranted. For no matter the urgency, policy that promotes rapid, development, adoption and scaling of technologies without consideration of how innovation re-structures relationships of accountability runs the risk of advancing irresponsible innovation.

End notes

ⁱ These failures are evident in controversies of contact tracing technologies that did not and could not work (Boland and Wright, 2020; Lynskey and Veale, 2020) - not least amongst people living and working in care homes. In centralised testing infrastructures that didn't work as promised and give rise to mistrust instead of efficiency (Leach, 2020). And in technological solutions in acute care settings that have neglected the resource needs of long-term care in communities. Moreover, technology-led responses have failed to address new social situations as they have arisen (Chiusi, Fischer and Spielkamp, 2020).

ⁱⁱ A description of the search protocol used, and an overview of the projects returned is provided in the Supplemental Data.

ⁱⁱⁱ In a presentation to the European Robotics Forum, Malaga, Spain, March 2020.

References

- Age UK (2019a) 'Briefing: Health and Care of Older People in England 2019', (February), pp. 1–68.
- Age UK (2019b) *Later life in the United Kingdom 2019 - Factsheet*. London. Available at: <https://www.ageuk.org.uk/our-impact/policy-research/policy-positions/>.
- Ballon, P., Pierson, J. and Delaere, S. (2005) 'Testing and experimentation platforms for broadband innovation: examining European practice', in *16th International Telecommunications Society Europe Conference*. Porto: SSRN, pp. 1–22. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1331557.
- Baxter, K., Heavey, E. and Birks, Y. (2020) 'Choice and control in social care: Experiences of older self-funders in England', *Social Policy & Administration*. Blackwell Publishing Ltd, 54(3), pp. 460–474. doi: 10.1111/spol.12534.
- Benjamin, R. (2016) 'Catching Our Breath: Critical Race STS and the Carceral Imagination', *Engaging Science, Technology, and Society*, 2(June), p. 145. doi: 10.17351/ests2016.70.
- Benjamin, R. (ed.) (2019) *Captivating Technology: race, carceral technoscience, and liberatory imagination in everyday life*. Durham and London: Duke University Press.

-
- Berridge, C. *et al.* (2014) 'Technology-Based Innovation for Independent Living: Policy and Innovation in the United Kingdom, Scandinavia, and the United States', *Journal of Aging & Social Policy*. Routledge, 26(3), pp. 213–228. doi: 10.1080/08959420.2014.899177.
- Blakeley, G. and Quilter-Pinner, H. (2019) *Who Cares? The Financialisation of Adult Social Care*. London. Available at: www.ippr.org/research/publications/financialisation-in-social-care.
- Blume, S. and Geesink, I. (2000) 'A brief history of polio vaccines', *Science*. American Association for the Advancement of Science, 288(5471), pp. 1593–1594.
- Boden, M. *et al.* (2017) 'Principles of robotics: regulating robots in the real world', *Connection Science*, 29(2), pp. 124–129. doi: 10.1080/09540091.2016.1271400.
- Boland, H. and Wright, M. (2020) 'NHS intensifies talks with Apple as Isle of Wight trial for contact-tracing app stutters', *The Telegraph*, 8 May. Available at: <https://www.telegraph.co.uk/news/2020/05/08/nhs-intensifies-talks-apple-isle-wight-trial-contact-tracing/> (Accessed: 4 June 2020).
- Bone, F. *et al.* (2019) *DARE to be different? Applying diversity indicators to the evaluation of collaborative research projects*, *SPRU Working Paper Series*. 2019–09. Brighton UK. Available at: <https://ideas.repec.org/p/sru/ssewps/2019-09.html>.
- Buhalis, D. and Darcy, S. (2010) *Accessible tourism: Concepts and issues*. Channel View Publications.
- Caleb-Solly, P. (2016) 'A brief introduction to ... Assistive robotics for independent living', *Perspectives in Public Health*, 136(2), pp. 70–72. doi: 10.1177/1757913915627445.
- Care Quality Commission (2018) *Beyond barriers: how older people move between health and care in England*. Newcastle upon Tyne. Available at: <https://www.cqc.org.uk/publications/themed-work/beyond-barriers-how-older-people-move-between-health-care-england> (Accessed: 8 June 2020).
- Chambers, C. (2020) *Stay at home. Save lives. Protect the NHS. - The Nuffield Council on Bioethics*, *Nuffield Council on Bioethics*. Available at: <https://www.nuffieldbioethics.org/blog/stay-at-home-save-lives-protect-the-nhs> (Accessed: 4 June 2020).
- Chiusi, F., Fischer, S. and Spielkamp, M. (2020) *Automated Decision-Making Systems in the COVID-19 Pandemic: A European Perspective*. *Automating Society Report 2020*. Gütersloh. Available at: <https://www.bertelsmann-stiftung.de/en/publications/publication/did/automated-decision-making-systems-in-the-covid-19-pandemic-a-european-perspective-all> (Accessed: 27 October 2020).
- Clarke, A. E. (2009) 'From Grounded Theory to Situational Analysis. What's New? Why? How?', in Morse, J. M. *et al.* (eds) *Developing Grounded Theory, Developing Qualitative Inquiry*. Walnut Creek, CA, pp. 194–233.
- Cory, G. (2019) *Better evidence for better care. How can data improve the social-care system in the UK? | doteveryone*. London. Available at: <https://doteveryone.org.uk/wp-content/uploads/2018/11/Better-Evidence-for-Better-Care-by-Giselle-Cory.pdf>.
- Cutler, T. and Waine, B. (2003) 'Advancing public accountability? The social services "star" ratings', *Public Money and Management*. Routledge, 23(2), pp. 125–128. doi: 10.1080/09540962.2003.10874834.
- Deith, J. (2020) *BBC Radio 4 - File on 4, Coronavirus: The care homes catastrophe*, *bbc.co.uk*. Available at: <https://www.bbc.co.uk/programmes/m000j81c> (Accessed: 4 June 2020).
- Department of Health and Social Care (2020a) *Admission and Care of Residents during COVID-19 Incident in a Care Home. Version 1. Published 2 April 2020*. London. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/886140/admission_and_care_of_residents_during_covid19_incident_in_a_care_home.pdf.
- Department of Health and Social Care (2020b) *Coronavirus (COVID-19): admission and care of people in care homes - GOV.UK, HM Government*. Available at:

- <https://www.gov.uk/government/publications/coronavirus-covid-19-admission-and-care-of-people-in-care-homes> (Accessed: 4 June 2020).
- Department of Health and Social Care (2020c) *Coronavirus (COVID-19): care home support package* - GOV.UK, HM Government. Available at: <https://www.gov.uk/government/publications/coronavirus-covid-19-support-for-care-homes/coronavirus-covid-19-care-home-support-package> (Accessed: 4 June 2020).
- Department of Health and Social Care (2020d) *COVID-19: guidance for supported living and home care* - GOV.UK, HM Government. Available at: <https://www.gov.uk/government/publications/covid-19-residential-care-supported-living-and-home-care-guidance> (Accessed: 4 June 2020).
- Department of Health and Social Care (2020e) *Government launches new portal for care homes to arrange coronavirus testing* - GOV.UK, HM Government. Available at: <https://www.gov.uk/government/news/government-launches-new-portal-for-care-homes-to-arrange-coronavirus-testing> (Accessed: 4 June 2020).
- Dunn, P. *et al.* (2020) *COVID-19 policy tracker*, The Health Foundation. Available at: <https://www.health.org.uk/news-and-comment/charts-and-infographics/covid-19-policy-tracker> (Accessed: 4 June 2020).
- Eubanks, V. (2019) *Automating inequality: how high-tech tools profile, police, and punish the poor*. New York, NY: St. Martin's Press.
- Flyvbjerg, B. (2006) 'Five Misunderstandings About Case-Study Research', *Qualitative Inquiry*, 12(2), p. 219. doi: 10.1177/1077800405284363.
- Freeman, C. and Soete, L. (1997) *The Economics of Industrial Innovation*. London: Routledge.
- Gallistl, V. and Wanka, A. (2019) 'Representing the "older end user"? Challenging the role of social scientists in the field of "active and assisted living"', *International Journal of Care and Caring*. The Policy Press, 3(1), pp. 123–128. doi: 10.1332/239788218x15411705865226.
- Genus, A. and Stirling, A. (2018) 'Collingridge and the dilemma of control: Towards responsible and accountable innovation', *Research Policy*. North-Holland, 47(1), pp. 61–69. doi: 10.1016/J.RESPOL.2017.09.012.
- Gigler, B.-S. (2020) *COVID-19: a call to join forces to innovate | Shaping Europe's digital future*, European Commission. Available at: <https://ec.europa.eu/digital-single-market/en/blogposts/covid-19-call-join-forces-innovate> (Accessed: 4 June 2020).
- Glendinning, C. (2017) 'Long-term care and austerity in the UK: a growing crisis', in Greve, B. (ed.) *Long-term care for the elderly in Europe: development and prospects*. Abingdon, Oxon.
- Hignett, K. (2020) 'System failure' on personal protective equipment | *Expert Briefing | Health Service Journal, HSJ*. Available at: <https://www.hsj.co.uk/finance-and-efficiency/system-failure-on-personal-protective-equipment/7027207.article> (Accessed: 4 June 2020).
- HM Government (2020) *COVID-19: review of disparities in risks and outcomes - Public Health England*. London. Available at: <https://www.gov.uk/government/publications/covid-19-review-of-disparities-in-risks-and-outcomes> (Accessed: 15 June 2020).
- InnovateUK (2013) *The long-term care revolution - competition display page - InnovateUK, Innovate UK*. Available at: https://sbri.innovateuk.org/competition-display-page/-/asset_publisher/E809e7RZ5ZTz/content/the-long-term-care-revolution/1524978 (Accessed: 15 June 2020).
- Jasanoff, S. and Kim, S.-H. (2015) *Dreamscapes of modernity: sociotechnical imaginaries and the fabrication of power*. Chicago, IL: University of Chicago Press.
- Khaksar, S. M. S. *et al.* (2016) 'Service Innovation Using Social Robot to Reduce Social Vulnerability among Older People in Residential Care Facilities', *Technological Forecasting and Social Change*. Elsevier Inc., 113, pp. 438–453. doi: 10.1016/j.techfore.2016.07.009.

-
- Knowledge Transfer Network (2020) *KTN | Innovate UK Covid-19 fast-track competition launched today*, Knowledge Transfer Network Ltd. Available at: <https://ktn-uk.co.uk/news/innovate-uk-covid-19-fast-track-competition-launched-today> (Accessed: 4 June 2020).
- Langstrup, H. (2013) 'Chronic care infrastructures and the home', *Sociology of Health & Illness*. John Wiley & Sons, Ltd, 35(7), pp. 1008–1022. doi: 10.1111/1467-9566.12013.
- Leach, M. (2020) *Echoes of Ebola: social and political warnings for the COVID-19 response in African settings* | *Somatosphere*, *Somatosphere*. Available at: <http://somatosphere.net/forumpost/echoes-of-ebola/> (Accessed: 4 June 2020).
- Light, A. and Seravalli, A. (2019) 'The breakdown of the municipality as caring platform: lessons for co-design and co-learning in the age of platform capitalism', *CoDesign*. Taylor & Francis, 15(3), pp. 192–211. doi: 10.1080/15710882.2019.1631354.
- Lynskey, O. and Veale, M. (2020) *Supplementary Written Evidence on COVID-19 Tracing Apps to the Joint Committee on Human Rights*. LawArXiv.
- Macnaghten, P. (2020) *The Making of Responsible Innovation*. Cambridge University Press.
- Marres, N. (2020) 'For a situational analytics: An interpretative methodology for the study of situations in computational settings', *Big Data and Society*, 0, p. 0. doi: 10.1177/2053951720949571.
- Mostaghel, R. (2016) 'Innovation and technology for the elderly: Systematic literature review', *Journal of Business Research*. Elsevier Inc., 69(11), pp. 4896–4900. doi: 10.1016/j.jbusres.2016.04.049.
- National Audit Office (2018) *Adult social care at a glance*, National Audit Office. London. Available at: <https://www.nao.org.uk/wp-content/uploads/2018/07/Adult-social-care-at-a-glance.pdf>.
- National Audit Office (2020) *Readying the NHS and adult social care in England for COVID-19 - National Audit Office (NAO) Report*. London. Available at: <https://www.nao.org.uk/report/readying-the-nhs-and-adult-social-care-in-england-for-covid-19/> (Accessed: 16 June 2020).
- NHS Digital (2018) *Measures from the Adult Social Care Outcomes Framework, England - 2017-18, NHS Digital*. Available at: <https://digital.nhs.uk/data-and-information/publications/statistical/adult-social-care-outcomes-framework-ascof/current> (Accessed: 11 June 2020).
- Noble, S. U. (2018) *Algorithms of oppression: data discrimination in the age of Google*. New York, NY: New York University Press.
- O'Donovan, C., Michalec, A. (Ola) and Moon, J. R. (2020) *Capabilities for Transdisciplinary Research. An Evaluation Framework and Lessons from the ESRC Nexus Network +, SPRU Working Paper Series*. 2020–12. Brighton. Available at: <http://www.sussex.ac.uk/spru/swps2020-12>.
- O'Neil, C. (2016) 'Weapons of math destruction: how big data increases inequality and threatens democracy'. New York: Random House. Available at: <http://link.overdrive.com/?websiteID=100434&titleID=2525880>.
- OECD (2005) *Ensuring quality long-term care for older people, Policy Brief*. Paris. Available at: <https://www.oecd.org/els/health-systems/Ensuring-quality-long-term-care-for-older-people.pdf>.
- Parliamentary Office of Science & Technology (2018) 'Robotics in Social Care', *Houses of Parliament, Parliamentary Office of Science and Technology*. London: Parliamentary Office of Science & Technology, pp. 1–7. Available at: <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/POST-PN-0591>.
- Pfotenhauer, S. M., Juhl, J. and Aarden, E. (2019) 'Challenging the “deficit model” of innovation: Framing policy issues under the innovation imperative', *Research Policy*. Elsevier, 48(4), pp. 895–904. doi: 10.1016/j.respol.2018.10.015.
- Prescott, T. and Caleb-Solly, P. (2017) 'Robotics in Social Care: A Connected Care EcoSystem for Independent Living', *EPSRC UK-RAS Whitepaper*, pp. 2–25. Available at: <https://www.ukras.org/wp->

- content/uploads/2018/10/UK_RAS_wp_social_spread_low_res_ref.pdf.
- Ranci, C. and Pavolini, E. (eds) (2013) *Reforms in Long-Term Care Policies in Europe*. New York: Springer. doi: 10.1007/978-1-4614-4502-9.
- Savona, M. (2019) *The Value of Data: Towards a Framework to Redistribute It*, SPRU Working Paper Series. 21. Brighton, UK. Available at: <https://www.sussex.ac.uk/webteam/gateway/file.php?name=2019-21-swps-savona.pdf&site=25>.
- Science and Technology Select Committee (2020) *Oral evidence - Ageing: Science, Technology and Healthy Living - 4 Feb 2020, House of Lords*. Available at: <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee-lords/ageing-science-technology-and-healthy-living/oral/106985.html> (Accessed: 15 June 2020).
- Shakespeare, T., Stöckl, A. and Porter, T. (2018) 'Metaphors to work by: The meaning of personal assistance in England', *International Journal of Care and Caring*. Policy Press, 2(2), pp. 165–179. doi: 10.1332/239788218X15187915600658.
- Sharkey, A. and Sharkey, N. (2012) 'Granny and the robots: ethical issues in robot care for the elderly', *Ethics and Information Technology*, 14, pp. 27–40. doi: 10.1007/s10676-010-9234-6.
- Smallman, M. (2019) 'Policies designed for drugs won't work for AI', *Nature*, 567(7746), p. 7. doi: 10.1038/d41586-019-00737-2.
- Smith, A. (2018) 'Smart cities need thick data, not big data', *The Guardian*, 18 April. Available at: <https://www.theguardian.com/science/political-science/2018/apr/18/smart-cities-need-thick-data-not-big-data> (Accessed: 11 June 2020).
- Spanakis, E. G. *et al.* (2016) 'Technology-based innovations to foster personalized healthy lifestyles and well-being: a targeted review', *Journal of Medical Internet Research*. Journal of Medical Internet Research, 18(6). doi: 10.2196/jmir.4863.
- Sparrow, R. (2016) 'Robots in aged care: a dystopian future?', *AI and Society*. Springer-Verlag London Ltd, 31(4), pp. 445–454. doi: 10.1007/s00146-015-0625-4.
- Sparrow, R. (2020) 'Robotics Has a Race Problem', *Science, Technology, & Human Values*. SAGE Publications Inc., 45(3), pp. 538–560. doi: 10.1177/0162243919862862.
- Stilgoe, J. (2020) *Who's Driving Innovation? New Technologies and the Collaborative State*. Cham: Palgrave Macmillan Ltd.
- Stirling, A., O'Donovan, C. and Ayre, B. (2018) *Which Way? Who says? Why? Questions on the Multiple Directions of Social Progress, Technology's Stories*. doi: 10.15763/jou.ts.2018.05.14.02.
- The King's Fund (2019) *Key facts and figures about adult social care*, *The Kings Fund*. London. Available at: <https://www.kingsfund.org.uk/audio-video/key-facts-figures-adult-social-care>.
- UKRI (2020) *UKRI Annual Report and Accounts 2019-20*. Swindon. doi: 10.1179/pma.2011.45.2.466.
- Weiner, K. and Will, C. (2018) 'Thinking with care infrastructures: people, devices and the home in home blood pressure monitoring', *Sociology of Health & Illness*. Blackwell Publishing Ltd, 40(2), pp. 270–282. doi: 10.1111/1467-9566.12590.
- Whittaker, M., Crawford, K., Dobbe, R. *et al.* (2018) *AI Now Report 2018*, *AI Now*. Available at: https://ainowinstitute.org/AI_Now_2018_Report.pdf.
- Whittlestone, J. *et al.* (2019) *Ethical and societal implications of algorithms, data, and artificial intelligence: a roadmap for research*. London: The Nuffield Foundation. Available at: <http://www.nuffieldfoundation.org/sites/default/files/files/Ethical-and-Societal-Implications-of-Data-and-AI-report-Nuffield-Foundat.pdf>.
- Wilson, J. *et al.* (2020) 'The Value of Data: Applying a Public Value Model to the English National Health Service', *Journal of medical Internet research*. NLM (Medline), 22(3), p. e15816. doi:

10.2196/15816.

Winkle, K., Lemaignan, S., *et al.* (2019) 'Effective Persuasion Strategies for Socially Assistive Robots', in *ACM/IEEE International Conference on Human-Robot Interaction*. IEEE Computer Society, pp. 277–285. doi: 10.1109/HRI.2019.8673313.

Winkle, K., Caleb-Solly, P., *et al.* (2019) 'Mutual Shaping in the Design of Socially Assistive Robots: A Case Study on Social Robots for Therapy', *International Journal of Social Robotics*. Springer Science and Business Media LLC, pp. 1–20. doi: 10.1007/s12369-019-00536-9.

About the author

Cian O'Donovan is a research associate at the Department of Science and Technology Studies, University College London. He is researching the practices, policies and potentials of innovation in artificial intelligence, robotics and social care policy in the UK and European Union (www.scalings.eu). Twitter: @cian Orcid: <https://orcid.org/0000-0003-4467-9687>

Acknowledgements

I am grateful for the participation of interviewees and other expert respondents and to colleagues on the SCALINGS research project. Thanks to Jack Stilgoe, and to colleagues at a UCL STS Work in Progress seminar, for comments on previous drafts of this manuscript. All errors and omissions remain my own.

Funding

Original research in this article was funded through the European Union's Horizon 2020 research and innovation program [788359] (SCALINGS: Scaling up co-creation? Avenues and limits for including society in science and innovation).

Supplemental data: UK social care innovation and technology research funding. UKRI funded projects 2006-2019

UK public funded innovation and technology research in social care was identified in the UKRI's Gateway to Research database at <https://gtr.ukri.org/> using queries of the form "social care" AND innovation; "social care" AND technology snowballing variants until no new and appropriate results were returned. 218 unique research projects were returned. 127 were included in the final corpus after projects were excluded following an initial review. Total funding from UKRI research councils across the corpus was £111,715,022.

Note, the search protocol was not designed to comprehensively report all studies that in some way incorporate innovation and social, rather to reveal the projects that are most likely to correspond to this paper's interest in purposeful and impactful innovation in the sector.

Ref #	Funder	Title	Start date	Duration (months)	Award (£)	Funder reference
1	EPSRC	Health and Care Infrastructure Research and Innovation Centre (HaCIRIC)	Jun 2006	60	7,236,672	EP/D039614/1
2	EPSRC	IMA International Conference on Quantitative Modelling in the Management of Health Care	Apr 2007	3	3,824	EP/E065643/1
3	AHRC	Women, Ageing and Media (WAM)	Jul 2008	6	24,358	AH/F012667/1

4	EPSRC	Innovative Technology for Healthcare Delivery - The MIMIT: CIMIT Collaboration	Apr 2009	43	1,293,604	EP/G041733/1
5	EPSRC	MultiMemoHome: Multimodal Reminders Within the Home	Sep 2009	42	246,011	EP/G060614/1
6	EPSRC	MultiMemoHome: Multimodal Reminders Within the Home	Oct 2009	41	57,585	EP/G060797/1
7	EPSRC	MultiMemoHome: Multimodal Reminders Within the Home	Oct 2009	42	474,931	EP/G069387/1
8	Innovate UK	PEACEanywhere	Oct 2009	39	1,214,451	400055
9	Innovate UK	Utilising communications technologies for anytime and anywhere assistedliving solutions	Oct 2009	26	1,420,132	400052
10	MRC	Development of interventions to enhance health and wellbeing in later life (The LIVEWELL programme)	Mar 2010	60	2,246,699	G0900686
11	EPSRC	The Care Life Cycle: Responding to the Health and Social Care Needs of an Ageing Society	May 2010	66	2,808,300	EP/H021698/1
12	MRC	What are the impacts of user involvement in health and social care research and how can they be measured?	Jan 2011	33	685,814	G0902155
13	Innovate UK	Scaleable and Open Framework for Human and Digital Trust between Informal and Formal Infrastructures in Personal Health Care	Feb 2011	24	802,964	400205
14	Innovate UK	Assistive Technologies for Healthy living in Elders: Needs assessment by Ethnography	Jun 2011	27	583,297	400217
15	Innovate UK	Overcoming barriers to mainstreaming Assisted Living Technologies	Jun 2011	42	1,806,533	400220
16	EPSRC	Health and care infrastructure research and innovation centre (HACIRIC) extension.	Jun 2011	30	3,876,561	EP/I029788/1
17	Innovate UK	Designing Scalable Assistive Technologies and Services for Independent Healthy Living and Sustainable Market Development in the Mixed Digital Economy	Jul 2011	37	1,433,287	400218
18	AHRC	International Health Humanities Network	Aug 2011	24	30,254	AH/J002208/1
19	Innovate UK	Tackling Barriers to Adoption of Assisted Living Technology for Older Adults	Sep 2011	30	520,832	400221
20	ESRC	Maximising the Use of Existing Administrative Data Sets for Wales through Computer Modelling and Simulation	Oct 2011	12	66,525	ES/J011363/1
21	Innovate UK	CAREatHOME	Dec 2011	36	100,100	600421
22	ESRC	The role of mutuals in public service innovation	Jan 2012	24	224,922	ES/J008435/1
23	Innovate UK	METALL (Metadata-Enabled Tools for Assistive Living & Learning)	Jan 2012	19	620,781	101034
24	EPSRC	TRUMP: A Trusted Mobile Platform for the Self-Management of Chronic Illness in Rural Areas	Jan 2012	49	1,684,860	EP/J00068X/1
25	MRC	Multi-dimensional Health Risk Appraisal for Older People: embedding promotion of health and well-being in practice	Jan 2012	24	256,736	G1001822
26	ESRC	Making Social Work Count: A National Curriculum Development Programme Pioneered in Three Universities	Jan 2012	36	70,754	ES/J011835/1
27	AHRC	Improving well-being and community connectivity for people with dementia through community based arts interventions	Feb 2012	4	11,996	AH/J011029/1
28	Innovate UK	How Can Smart Home Data and Systems Improve Assisted Living Services	Mar 2012	4	50,000	130755

29	ESRC	NILS-RSU: Continuation 2012-2017	Aug 2012	68	1,099,703	ES/K000462/1
30	ESRC	CARERS IN THE 21ST CENTURY: DEVELOPING THE EVIDENCE BASE	Sep 2012	12	15,360	ES/J021229/1
31	EPSRC	Kinetic User Interfaces and Multiuser 3D Virtual Worlds for Older People	Sep 2012	15	97,396	EP/J010766/1
32	ESRC	The Market and Health Care Production	Dec 2012	48	500,351	ES/J023108/1
33	ESRC	Towards equal and active citizenship: pushing the boundaries of participatory research with people with learning disabilities	Dec 2012	2	18,146	ES/J02175X/1
34	ESRC	Creating a 'Health Talk Online' web-based resource on family experiences of disorders of consciousness	Feb 2013	18	23,920	ES/K00560X/1
35	ESRC	Towards equal and active citizenship: pushing the boundaries of participatory research with people with learning disabilities	Mar 2013	22	16,411	ES/J02175X/2
36	ESRC	Does Smaller mean Better? Evaluating Micro-Enterprises in Adult Social Care	Apr 2013	27	357,580	ES/K002317/1
37	ESRC	AAL-WELL Ambient Assistive Living Technologies for Wellness, Engagement and Long Life	Apr 2013	46	144,591	ES/K011138/1
38	BBSRC	Visual motion perception in healthy ageing	Jul 2013	28	221,357	BB/K007173/1
39	EPSRC	Mobility, Mood and Place: a user-centred approach to design of built environments to make mobility easy, enjoyable and meaningful for older people	Sep 2013	44	1,273,656	EP/K037404/1
40	Innovate UK	One Precious Life	Jan 2014	9	425,784	971382
41	ESRC	Smart Data Analytics for Business and Local Government	Jan 2014	82	5,198,275	ES/L011859/1
42	AHRC	A Development project to determine and progress the 'state of the Art' of Design theory and Practice in healthcare	Mar 2014	6	39,530	AH/L013908/1
43	ESRC	Comprehensive approach to modelling outcome and cost impacts of interventions for dementia	Mar 2014	57	2,613,207	ES/L001896/1
44	AHRC	Developing a co-produced, digital, and living archive of learning disability history: An exploration of ethics, ownership and new connectivities	Apr 2014	39	805,223	AH/K007459/1
45	EPSRC	EPSRC Centre for Doctoral Training in Digital Civics	Apr 2014	102	4,707,495	EP/L016176/1
46	EPSRC	EPSRC - NIHR HTC Partnership Award: Promoting Real Independence through Design Expertise (PRIDE)	May 2014	39	149,896	EP/M000273/1
47	Innovate UK	Big Data: Digitisation, Semantic Analysis, Topic Modelling, Visualisation and Exploration.	May 2014	24	356,457	101779
48	ESRC	Investigating the barriers and facilitators of the implementation of NICE's public health guidance and quality standards in	May 2014	23	86,278	ES/L006995/1
49	Innovate UK	Aerospacer: A pressure relieving mattress overlay from Medstrom Ltd for the prevention of pressure ulcers	Oct 2014	14	70,466	720552
50	AHRC	Designing Innovative Interventions with People Living with Dementia	Nov 2014	15	83,366	AH/M005348/1
51	ESRC	Family inclusive policy and practice after 'Think Family'	Dec 2014	16	82,536	ES/M006018/1
52	Innovate UK	Limb Glider Intelligent Rehabilitation Device	Jan 2015	24	239,711	720437
53	Innovate UK	AAL IntegrAAL	Jan 2015	30	295,018	600468

54	ESRC	Inciting dialogue and disruption - developing participatory analysis of the experience of living with dementia and dementia care	Feb 2015	18	163,892	ES/L01470X/1
55	ESRC	Euro-China UPC: Optimising care delivery models to support ageing-in-place: towards autonomy, affordability and financial sustainability - ODESSA	Feb 2015	19	374,609	ES/L016095/1
56	Innovate UK	Assistive Smart Watch Applications	Apr 2015	7	76,308	710662
57	AHRC	Phronesis and the Medical Community	May 2015	36	659,968	AH/M006646/1
58	MRC	META-DAC - Managing Ethico-social and Technical issues and Administration of Data Access Committee	Jun 2015	21	309,884	MR/N01104X/1
59	EPSRC	Wearable Soft Robotics for Independent Living	Jul 2015	42	2,026,737	EP/M026388/1
60	EPSRC	The CHERISH-DE Centre - Challenging Human Environments and Research Impact for a Sustainable and Healthy Digital Economy	Jul 2015	71	3,091,610	EP/M022722/1
61	ESRC	Buildings in the making: a sociological exploration of architecture in the context of health and social care	Aug 2015	38	355,626	ES/M008398/1
62	ESRC	Establishing outcomes of care proceedings for children before and after care proceedings reform	Sep 2015	35	455,788	ES/M008541/1
63	Innovate UK	Collaborating to deliver social-prescribing in Bath and North East Somerset	Oct 2015	27	301,973	102412
64	ESRC	New practices for new publics: interdisciplinary dialogues about practice theory approaches and civil society. Seminar series.	Nov 2015	28	30,184	ES/N009398/1
65	EPSRC	DERC: Digital Economy Research Centre	Nov 2015	69	4,051,357	EP/M023001/1
66	ESRC	Democratic renewal in Civil Society Organisations	Nov 2015	24	21,655	ES/N009096/1
67	ESRC	HEALTHY URBAN LIVING AND AGEING IN PLACE: PHYSICAL ACTIVITY, BUILT ENVIRONMENT AND KNOWLEDGE EXCHANGE IN BRAZILIAN CITIES (HULAP)	Jan 2016	39	468,570	ES/N013336/1
68	Innovate UK	Caring Cloud	Feb 2016	6	5,000	753559
69	Innovate UK	CityVerve	Jul 2016	33	9,781,984	102561
70	EPSRC	Fast ASsessment and Treatment in Healthcare (FAST Healthcare)	Aug 2016	54	628,709	EP/N027000/1
71	ESRC	Euro-China UPC: Optimising care delivery models to support ageing-in-place: towards autonomy, affordability and financial sustainability - ODESSA	Sep 2016	18	207,006	ES/L016095/2
72	EPSRC	A Robot Training Buddy for adults with ASD	Nov 2016	50	711,763	EP/N034546/1
73	EPSRC	Acoustic Signal Processing and Scene Analysis for Socially Assistive Robots	Jan 2017	36	330,104	EP/P001017/1
74	EPSRC	A Robot Training Buddy for adults with ASD	Jan 2017	42	355,563	EP/N035305/1
75	AHRC	Supporting the creative use of technology to improve life story work for vulnerable children- trove as a case example from REACT	Jan 2017	23	161,560	AH/P013252/1
76	Innovate UK	A Mental Health Patient Centric Continuous Care Solution: The Balsamee Care Solution	Mar 2017	9	68,781	102989
77	MRC	META-DAC - Managing Ethico-social and Technical issues and Administration of Data Access Committee	Apr 2017	16	139,017	MR/N01104X/2

78	Innovate UK	YOUBAN: robotic solutions to assist the elderly in daily mobility activities and using robot companionship to offset loneliness and isolation	Apr 2017	28	667,185	102871
79	MRC	Going beyond health related quality of life - towards a broader QALY measure for use across sectors	May 2017	42	445,442	MR/P015549/1
80	Innovate UK	Aston University and The Extracare Charitable Trust	Jun 2017	18	55,443	511019
81	EPSRC	Number Understanding Modelling in Behavioural Embodied Robotic Systems	Sep 2017	38	100,958	EP/P030033/1
82	Innovate UK	CAT/2: Big Data Content Analytics with particular reference to Probabilistic Neural Topic Models	Oct 2017	27	645,150	103652
83	Innovate UK	Monitoring physical frailty in older adult's homes with a new walking speed sensor; from prototype to proven concept	Jan 2018	12	56,325	133400
84	ESRC	Advancing business innovation and skills development in the home care sector	Jan 2018	36	266,499	ES/S001700/1
85	AHRC	The Imagination Café	Jan 2018	12	79,860	AH/R004900/1
86	Innovate UK	Team gamification of health CPD: closing the gap between research and practice.	Feb 2018	12	33,180	133414
87	Innovate UK	TALKING TECHNOLOGY ENABLED CARE - A personalised, visual, digital platform to transform health, social care and housing services	Feb 2018	12	56,628	133418
88	MRC	Methods for the privacy preserving analysis of sensitive health data: text analysis and data visualisation	Feb 2018	36	224,395	MR/S003959/1
89	ESRC	Reclaiming social care: Adults with learning disabilities seizing opportunities in the shift from day services to community lives	Feb 2018	24	296,996	ES/P011764/1
90	Innovate UK	Introduction of GaitSmart in the care pathway for the elderly to reduce falls and improve the quality of life of individuals	Jun 2018	10	76,474	133680
91	EPSRC	Data Analytics for Health-Care Profiling using Smart Meters	Jun 2018	14	99,892	EP/R020922/1
92	Innovate UK	University of the West of England, Bristol and The Extracare Charitable Trust	Sep 2018	24	74,207	511283
93	Innovate UK	Supporting innovation in health and social care - What does good innovation look like?	Oct 2018	18	593,475	104671
94	EPSRC	SPHERE - A Sensor Platform for HEalthcare in a Residential Environment (IRC Next Steps)	Oct 2018	42	3,630,821	EP/R005273/1
95	Innovate UK	Care City: Transforming how we find, treat and manage long-term conditions	Oct 2018	18	1,397,367	104654
96	Innovate UK	An Intergenerational Housing Model	Nov 2018	12	76,201	104661
97	ESRC	Violence, Abuse and Mental Health: Opportunities for Change	Nov 2018	48	1,020,181	ES/S004424/1
98	ESRC	Administrative Data Research Centres 2018	Nov 2018	29	2,786,405	ES/S007407/1
99	Innovate UK	Engaging Rural Micros for increased productivity	Dec 2018	6	58,483	104763
100	ESRC	Improving health and reducing health inequalities for people with severe mental illness: the 'Closing the Gap' Network+	Dec 2018	48	1,022,359	ES/S004459/1
101	ESRC	Enhancing the population-wide Northern Ireland Registry of Self-Harm and Suicide Ideation through data linkage	Dec 2018	24	157,410	ES/R011400/1
102	EPSRC	IRC Next Steps Plus : OPERA - Opportunistic Passive Radar for Non-Cooperative Contextual Sensing	Jan 2019	36	1,363,228	EP/R018677/1

103	AHRC	Therapeutic placemaking as a pathway to improved public health: realising our health and care centres of the future	Feb 2019	34	202,317	AH/S004459/1
104	AHRC	ART/DATA/HEALTH: Data as creative material for health and wellbeing	Feb 2019	27	200,750	AH/S004564/1
105	Innovate UK	Novel sensor algorithms for elder care	Mar 2019	14	206,854	105011
106	ESRC	The potential of Land Value Capture to secure sustainable urban development supporting air quality enhancement	Apr 2019	36	296,758	ES/T000279/1
107	Innovate UK	NQM Care Analytics	Apr 2019	21	342,120	105067
108	Innovate UK	Maternity Connect	Apr 2019	24	717,701	25397
109	EPSRC	UKRI Centre for Doctoral Training in AI-enabled healthcare systems	Apr 2019	102	6,684,742	EP/S021612/1
110	Innovate UK	TaCT Tracking and Communication Technology	Jun 2019	15	185,191	105253
111	ESRC	Dying in the Margins: uncovering the reasons for unequal access to home dying for the socio-economically deprived	Sep 2019	42	389,206	ES/S014373/1
112	Innovate UK	Engaging Rural Micros for increased productivity Trial	Sep 2019	17	399,957	105437
113	ESRC	Supporting adult social care innovation (SASCI)	Sep 2019	61	1,637,433	ES/T001364/1
114	MRC	Bringing Innovative Research Methods to Clustering Analysis of Multimorbidity (BIRM-CAM)	Oct 2019	36	609,909	MR/S027602/1
115	ESRC	Developing the evidence base for innovation in social care for children and families affected by domestic abuse	Oct 2019	48	1,628,380	ES/T001399/1
116	ESRC	The Research Centre on Micro-Social Change (MiSoC)	Oct 2019	60	6,114,094	ES/S012486/1
117	ESRC	Improving social care systems and practices for safeguarding young people at complex risk: what promotes and sustains innovation?	Nov 2019	48	1,529,006	ES/T00133X/1
118	AHRC	Memory - Identity - Rights in Records - Access: Embedding Participatory Recordkeeping in Child Social Care	Nov 2019	12	79,993	AH/T005343/1
119	ESRC	Exploring innovations in Transition to adulthood (EXIT Study)	Dec 2019	48	1,653,903	ES/T001348/1
120		Built Infrastructure for Older People in Conditions of Climate Change (BIOPICCC)		39		
	EPSRC		Sep 2009		279,282	EP/G061246/1
121	EPSRC	Built Infrastructure for Older People in Conditions of Climate Change (BIOPICCC)	Nov 2009	37	415,273	EP/G060843/1
122	Innovate UK	Warrington Intelligent Systems Engagement (WISE) - integrating multiple information flows to improve resilience for all urban communities.	Sep 2012	3	48,000	130970
123	ESRC	Support for carers of people with early onset dementia	Mar 2014	42	201,321	ES/L008866/1
124	ESRC	Utilising Big Data in the Practice of Torture Survivors' Rehabilitation	Sep 2015	24	211,183	ES/M010422/1
125	NERC	'Green infrastructure and the Health and wellbeing Influences on an Ageing population (GHIA)	Aug 2016	48	726,905	NE/N013530/1
126	ESRC	Inclusive and healthy mobility: Understanding trends in concessionary travel in the West Midlands	Feb 2017	15	126,323	ES/P010741/1

127	Innovate UK	100CC - The Community	100%	Connected	Jun 2018	21	1,026,847	104212
-----	-------------	--------------------------	------	-----------	----------	----	-----------	--------

(cc) Cian O'Donovan. This work is licensed under a Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License

