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Climate Change Assessments, Publics and Digital Traces of Controversy: An Experiment in Mapping Issues with Carbon Dioxide Removal Researchers

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Abstract

Recent scientific assessments of climate change have shifted towards evaluating solutions for removing atmospheric carbon dioxide (CDR). This paper reports a participation experiment in which we involved an interdisciplinary group of researchers in mapping issues relating to two CDR approaches: afforestation and bioenergy with carbon capture and storage (BECCS). We describe the responses of individual researchers when presented with visualisations aggregated from posts about afforestation and BECCS on the platform Twitter. We then compare the researchers' responses with a qualitative analysis of a subset of the Twitter data. The analysis highlights challenges the researchers experienced in identifying issues and relating these visualisations to their own research on afforestation and BECCS. We discuss the prospects for bringing experimental approaches to mapping issues, publics and participation into closer relation with science and technology assessments. The paper concludes with reflections on the value of qualitative traditions of STS research for digital controversy analysis.

Keywords: participation, publics, climate change assessments, greenhouse gas removal, digital methods, controversy analysis.

Introduction

Questions about the roles that publics play in assessments of climate change have acquired a new urgency as governments around the world assess the feasibility of large-scale removals of atmospheric carbon dioxide (CDR), a topic that has generated controversy among scientific communities and been dismissed by climate activists as a speculative tech-fix (Beck and Mahony, 2018; Geden, 2016; Markusson et al., 2018). Controversy over CDR proposals has been accompanied by calls for more 'responsible' approaches to assessing climate futures and related programmes of technological innovation. Proponents of responsible assessment argue that climate assessments need to become more reflexive and anticipatory about the social, technical and environmental futures CDR may bring forward (or foreclose) while being responsive to public concerns about developments in the science and politics of climate change (Beck and Mahony, 2018; Stilgoe et al., 2013). Approaches to 'participatory assessment' have long been experimented with in STS and cognate fields as means of involving publics in organised science and policy assessments, most often through 'invited' deliberative means (e.g. Darier et al., 1999; Guston, 2014). However, such invited participatory fora and formats have been criticised for eliciting public views in ways that exclude, and obscure, the different issues and forms of engagement that emerge around sociotechnical and environmental controversies, potentially fuelling antagonisms around processes of organised assessment (e.g. Callon et al., 2009; Chilvers and Kearnes, 2016; Wynne, 2007).

Recent work on participation in STS has thus sought take a different approach to the problem of public involvement, moving beyond invited forums to map diverse public engagements in wider issues, controversies and ecologies (Marres, 2015; Chilvers et al., 2018). These methods for mapping issues, publics and participation are yet to applied to the aforementioned challenges of responsible and participatory assessment. In this paper we therefore explore how such mapping methods – and digital controversy analysis in particular – might contribute to the practical task of assessing a controversial topic like CDR.

A variety of approaches propose that analysing 'digital traces'[1] of interaction recorded by online platforms can contribute to engaging publics with processes of issue formation between research, policy and innovation (Marres, 2015; Venturini, 2010). Experiments with repurposing digital records for social research have widely used climate change as a test case for methodological development (see examples in Rogers, 2013). However, these studies have so far taken place at a distance from scientific assessments of climate change, in relation to which digital platforms are predominantly engaged as media for communicating scientific consensus around assessments, such as those of the Intergovernmental Panel on Climate Change (IPCC), rather than as sites of issue formation (Pearce et al., 2019).

This paper presents the results of a participation experiment in which we involved an interdisciplinary group of researchers in the process of mapping issues relating to two CDR approaches: afforestation and bioenergy with carbon capture and storage (BECCS). Situated in the context of a project assessing afforestation and BECCS, we designed an experiment to involve the assessment researchers in the analysis of posts about afforestation and BECCS on the platform Twitter.

The first section of the paper presents an overview of controversies emerging around assessments of CDR and the different roles participation experiments can play in engaging science and technology assessments with publics. In the second section, we outline the issue mapping methodology and the experiment involving the assessment researchers. The subsequent analysis first describes the responses of the researchers to different aggregated visualisations assembled from the digital records collected from Twitter. We then compare the researchers' responses with a qualitative analysis of a subset of the Twitter data. The discussion situates this analysis in relation to the challenges of bringing public issues to bear on the assessment of controversial topics like CDR which challenge institutional settlements between (climate) science and politics, and raise questions about predominant methods for locating publics and engaging assessment processes with public issues. In concluding, we argue that digital traces of controversy are likely to become more relevant to climate change assessments as they shift towards evaluating CDR methods as solutions for governing the climate. We reflect on the challenges and prospects for bringing experimental approaches to mapping issues, publics and participation into closer relation with assessments of climate change and related techno-scientific developments. We suggest that evaluating the public relevance of digital records collected from platforms like Twitter may require mixed-methods approaches to controversy analysis that draw on longstanding qualitative traditions in STS.

The problem of public involvement in climate change assessments and controversies

Questions of public engagement with assessment processes take on particular significance in the context of CDR proposals which, on one hand, project rapid and sweeping technological and environmental changes while, on the other, often emerge from technocratic bodies, like the IPCC, that organise interactions between scientific and policy elites (Beck and Mahony, 2018; Geden, 2016; Markusson et al., 2018). Traditionally, climate change assessments of the kind undertaken by the IPCC have been presented as building on consensus theories of integrated assessment in environmental science, focusing on producing knowledge about the global climate and reducing uncertainties relating to impacts of future climate change (Hulme, 2009; Jasanoff et al., 1998; van der Sluijs et al., 1998). Controversially, the IPCC's Fifth Assessment report (IPCC, 2014) enacted a shift in assessment style towards addressing 'solutions' to mitigating climate change impacts (Beck and Mahony, 2018), focusing on CDR. The scenarios addressed in the Fifth Assessment report, which informed the 2015 Paris Agreement, rely heavily on 'negative emissions technologies' – chiefly, BECCS and afforestation – to perform future CDR (Geden, 2016). Analysts of controversies over the IPCC's Fifth Assessment have argued there is a need to develop more 'responsible' (Beck and Mahony, 2018) or 'reflexive' (Low and Schäfer, 2020) approaches to climate assessment that take into account the ways that framings of CDR delegate scientific and political agency. Controversies over CDR therefore raise questions about the ways climate assessments perform as processes for issue formation and agenda-setting rather than only the linear procedures for establishing consensus and informing centralised policy-making, described by much literature on climate governance (Markusson et al., 2018).

The feasibility of CDR has been widely assessed in terms of biophysical or techno-economic determinants, with far fewer assessments focusing on social and political dimensions (Forster et al., 2020). A variety of social science studies have raised questions about the roles public participation might play in assessments addressing the feasibility of CDR and its role in social and political responses to climate change (Waller et al., 2020). Recent elicitation processes involving stakeholders from government, industry and civil society have revealed the importance of governance, social acceptability and equity issues which are poorly accounted for in integrated assessment models (Forster et al., 2020; Vaughan and Gough, 2016). Social-psychological research combining surveys and focus groups in the US and UK found that perceptions of the 'naturalness' of afforestation may impact the social acceptance of engineered CDR approaches like BECCS (Cox et al., 2020). Elsewhere an experimental deliberative process on CDR has suggested that discourses of geoengineering may dominate framings of CDR and the ways publics engage with the issue in climate policy (Bellamy and Lezaun, 2017). Although undertaken from a variety of disciplinary orientations, these participation experiments suggest, in different ways, that public debates about CDR do not neatly map onto instrumental framings of BECCS and afforestation in climate policy as 'negative emissions technologies'. They highlight that framing the feasibility of afforestation and BECCS in narrowly biophysical and techno-economic terms, e.g. in terms of resource availability and future innovation, may obscure the performative role that CDR projections and targets play in climate politics and could contribute to public disengagement from climate policy (Waller et al., 2021).

Participatory approaches to integrated assessments of climate change have long centred on the development of procedures for representing public perceptions in scientific assessments and including public views in decision-making processes (e.g. Darier et al., 1999). The inclusion of stakeholders, such as model users and decision makers, in the development of modelling scenarios is common in integrated assessment practice (Tansey et al., 2002). Justifications for public participation in integrated assessment have often centred on challenges of demonstrating accountability of policy evidence produced by complex computational models (van der Sluijs, 2002). Approaches experimenting with the involvement of so-called 'lay publics' have focused both on the ways in which participation can expand the range of knowledges considered, for instance in scenario development, and the expansion of environmental problem definitions (Darier et al., 1999). Climate change-focused assessments involving citizens have often held dual aims of both connecting scientific uncertainties with social issues and, more pedagogically, informing citizens and raising awareness of their environmental impacts (Kasemir et al., 2000). Criticism of participatory approaches from integrated assessment practitioners makes clear that such experiments have often been seen to lack instrumental value for decision-making (van Asselt Marjolein and Rijkens-Klomp, 2002). Such criticism arguably highlights the predominance of consensus-oriented approaches within the integrated assessment community as well as an underlying political realism regarding the (linear) relations between policy-relevant, but neutral, scientific assessments and political decision-making about climate policy (Jasanoff et al., 1998).

This predominant version of participatory assessment has most often assumed an 'invited', 'realist' and representational approach to participation and publics (Chilvers and Kearnes, 2016; Wynne, 2007), whereby participating publics are invited by science and policy institutions into organised processes of public deliberation and elicitation that are seen to represent and correspond to the views and concerns of an external pre-existing public. Recent work on participation in STS and the study of public involvement with controversial technoscience issues highlights some shortcomings of such approaches to public participation in environmental and technology assessment. Social studies of scientific controversy have demonstrated the ways in which formal methods for representing public views, for instance surveys of risk perceptions, can obscure uncertainties, exclude distributed public engagements, and contribute to inflaming antagonisms (Callon et al., 2009). Such analysis has long cast scepticism on the capacity of organised participatory assessment to 'open-up' (Stirling, 2008) the instrumental framings of issues by governing authorities and prevailing political-economies that organise science and innovation (Jasanoff, 2003). Rather than democratising control over science and technology, common categories structuring public participation in assessments, such as distinctions between stakeholders and 'general publics', can therefore foreclose certain framings of issues and remove topics from the domain of legitimate public contestation (Irwin and Michael, 2003).

In response to such critiques, more experimental and relational approaches to public participation in STS have often therefore aimed to both detect issues that may be only latent in, or framed out of, organised assessments and create the social basis for novel forms of political collectivity to emerge (see discussions in Callon et al., 2009; Chilvers and Kearnes, 2016; Irwin and Michael, 2003; Lezaun et al., 2016). Such approaches highlight that the issues emerging around controversial topics like CDR are often not reducible to propositional form, and thus are not easily accommodated within traditional formats of scientific and policy assessment. Rather, such issues are often inseparable from the collectives and media that give them public expression and are thus often conceptualised as 'issue publics' (see discussion in Madsen and Munk, 2019). Bringing experimental approaches to participation into closer relation with organised assessments therefore raises questions about the ways methods for mapping issues relate to procedures for representing publics in organised assessments as well as to the processes through which controversial topics like CDR become publicised as such.

In exploring how emerging methods for mapping issues, publics and participation might contribute to assessments of CDR, our focus in this paper is on digital methods and digital controversy analysis in particular. This is far from the first time digital media-technologies have been considered as a means of public engagement with integrated assessment processes. However, previous proposals have assumed an invited model of participation where questions of public relevance are defined by scientific and policy elites. We see this, for instance, in the way Tansey et al. (2002) described the development of a regional integrated assessment model and the participatory possibilities offered via internet access:

Since the model has been developed to be used via the internet, stakeholder access on an unprecedented scale will be feasible and it will be possible for individuals and groups to use the model iteratively and to experiment with a range of scenarios. (Tansey et al., 2002: 102)

Through opening up to multiple forms of public relevance, our approach instead invites questions about the extent to which digital methods research might experimentally mediate between organised assessments and diverse publics that emerge around the controversial topics and objects assembled together in assessment processes.

The roles played by digital media-technologies, such as online platforms, in giving expression to public issues has provided a significant focus for recent methodological and conceptual developments in public engagement with controversial technoscience topics (Marres, 2015; Venturini, 2010). Debates about the repurposing of digital media-technologies as 'digital methods' for social research highlight that analysis of public issues today often has to confront problems of 'web epistemology' and questions of how digitally-mediated information gains visibility and is accepted as reliable (Rogers, 2013). Digital methods research has therefore provided a site for methodological experiments in analysing not simply representations of controversial technoscience topics in digital media coverage but examining the media-technological artifice involved in staging a topic or object as controversial (Marres and Moats, 2015; Venturini, 2010). Underlying digital methods experiments therefore is the notion that the social interactions and public expressions recorded by digital media-technologies are highly artificial and enact particular epistemological assumptions about how to measure and assess the public relevance of a topic and what makes an issue (Marres, 2015; Rogers, 2013).

Research that repurposes digital platforms as instruments with which to map public issues therefore raises questions about the potential for media bias and, relatedly, the partiality of digitally-mediated knowledge claims. Rather than treating digital platforms as reservoirs of data about public opinions, Marres (2015) argues that where the notion of the 'trace' maintains reference to the artifice involved in the recording of interactions and articulations by digital media-technologies. Rather than attempting to limit the bias of a medium, issue mapping research empiricises the problem of media effects in order to attend to the role digital platforms play in the enactment of controversy and public concern (Marres, 2015). Such an approach draws on observations relating to the performativity of digital controversy; that is, the study of controversies on digital platforms necessarily implies judgements by the researcher about the public relevance of the platform itself (Marres and Moats, 2015). A central methodological focus of issue mapping research therefore relates to how to test the findings of platform-based research and their public relevance (Madsen and Munk, 2019). The issue mapping experiment presented below can, we propose, be understood as exploring the roles digital methods can play in bringing public expressions on digital platforms to bear on the practices of researchers engaged in scientific assessments as well as contributing to debates about how to evaluate the public relevance of platforms like Twitter.

Methodology

The issue mapping approach developed in this study comprised a mixed-methods research design involving digital methods and semi-structured interviews. Between November 2018 and June 2020 the authors tracked Twitter terms relating to (1) bioenergy with carbon capture and storage (BECCS) (n=7,936), and (2) afforestation and reforestation (n=30,116).[2] The study engaged a group of interdisciplinary CDR researchers – with whom the authors were collaborating on a project assessing the feasibility of CDR from afforestation and BECCS[3] – in the issue mapping process through individual interviews. Participants were interviewed about the feasibility of afforestation and BECCS and then asked for their responses to visualisations assembled by aggregating (in different ways) the digital records collected from Twitter. We subsequently hand-coded a subset of the Twitter data to compare the researchers responses to the aggregated visualisations with the findings of a qualitative analysis.

The platform Twitter was chosen as a field site both because it is widely used by individual scientists and has been widely studied as a setting of climate change debate (Pearce et al., 2019).

The semi-structured interviews undertaken involved 12 researchers with whom the authors were collaborating on a project assessing the feasibility of large-scale removal of greenhouse gases via BECCS and afforestation. Participants included researchers from a variety of disciplinary backgrounds, including earth systems science, geography, biology, chemical engineering, economics, physics, political science and psychology. Prior to the interview, participants were asked to spend 10 minutes reading through a 'dossier' constructed from tweets collected about BECCS and afforestation. They were then asked to spend a further 10 minutes exploring two network visualisations showing the co-occurrence of hashtags in each dataset (see figures 2a & 2b), following a navigation guide provided.[4]

The dossier provided to participants visualised the following aggregated material relating to tweets about afforestation and BECCS:

- Overview of tweets collected (total number of tweets, number of retweets, number of replies, number of links, number of hashtags)
- Timeline visualisation of posting activity, by day (November 2018 to June 2020)
- Ranked list of 20 most frequently posting users
- Ranked list of 20 most frequent URL domains appearing in tweets (e.g. twitter.com)
- Ranked list of 20 most frequently retweeted posts

The network visualisations of co-occurring hashtags were constructed from original tweets (i.e. after removing duplicates), using the Table2Net software.[5] In the BECCS dataset 31% (n=2,448) of tweets contained two or more hashtags compared with 21% of tweets (n=6408) in the afforestation dataset. Each file was visualised in Gephi, removing the search terms and spatialising using the forceatlas2 layout algorithm (Jacomy et al., 2014). Node labels were sized according to term frequency in the dataset and the edges (links) between nodes were weighted by the number of connections, represented by thickness. The networks were then uploaded to an interactive network explorer software called mini-VAN software.[6] The links to the 'co-hashtag' visualisations (Marres, 2015) were given to participants along with the dossier.[7]

Co-hashtag analysis draws on co-word analysis techniques from actor-network theory that, in their early formulation, analysed the co-occurrence of keywords in scientific papers to identify emerging research problems between established research fields (Callon et al., 1986). Twitter hashtags are designed to enable users to attach content to topics that may cut across sub-communities on the platform. In principle, hashtags, like keywords, facilitate interactions around common topics rather than only between immediate networks of friends and followers. However, unlike scientific keywords, hashtags are not simply used as associative devices. We therefore treated the co-hashtag networks as experimental visualisations that may reveal as much about platform dynamics as about issue dynamics in the field of CDR (Marres, 2015). This enabled us to pose the relevance of the issues emerging on Twitter as a question that may have different answers depending on a particular researcher's relation to the platform.

The interviews aimed to both elicit substantive responses of participants as CDR experts and their personal and professional responses to Twitter as a prospective site of public engagement with CDR issues. In the interviews, participants were first asked about the feasibility issues that their research on BECCS and afforestation identified and their relationship to Twitter. They were subsequently asked for their responses to the dossier and the network visualisations and the extent to which feasibility issues could be detected in these. Verbal explanations of the network visualisations were provided drawing the analogy, outlined here, between co-word analysis in science studies and the study of emergent problems. Finally, participants were asked to reflect on the interview process, whether engaging with the visualisations had altered their prior view of Twitter as a setting of engagement and if any consequences followed for their research.

As we discuss below, the analysis of the interviews identified a series of platform-based contrasts between the afforestation and BECCS publics, which we characterise as 'Twitter-spheres'. In a subsequent step we therefore designed a test to compare the responses of the researchers with the results of a qualitative analysis on a subset of the Twitter data. To construct the subset of Twitter data we queried the afforestation and BECCS datasets for land-related issues. Land use issues were chosen because both BECCS and afforestation are likely to require significant land use change for biomass plantation and the avoidance of land use conflicts is a central feasibility issue for both of these CDR approaches (Waller et al., 2020). Using the TCAT software we queried the afforestation and BECCS datasets for the terms [land][8], [landuse]. This returned 142 BECCS tweets (5% of unique tweets in the dataset) and 352 afforestation tweets (6% of unique tweets in the dataset). The hashtags occurring in these tweets were coded onto the co-hashtag networks (constructed in the prior stage) for comparison.

The tweets in the land-related samples were then qualitatively analysed using a typology distinguishing between six dynamics of public engagement with the assessment of technoscientific issues. These six dynamics refer to rhetorical repertoires deployed by individuals and collectives to publicise and frame the issues being assessed, raise concerns and interact with other implicated actors (in the analysis below we use the shorthand of "repertoires of public assessment"). The typology was constructed on the basis of studies of CDR discourse (Waller et al., 2020), and draws on distinctions between modes of social appraisal and public engagement with environmental and technology assessment as well as existing typologies of science-policy interaction (Irwin and Michael, 2003; Pielke, 2007; Stirling, 2008). The typology is therefore premised on a symmetrical approach to the assessment of technoscientific issues, as a practice that heterogeneous actors engage in, not only those authorised to do so by scientific and policy-making institutions. The six categories we distinguish between are as follows:

1. *Claims scientific authority*: tweet makes scientific claim or invokes (social) scientific authority (e.g. link to journal paper).
2. *Contests a fact*: tweet contests a factual claim and offers counter-evidence (e.g. raises questions about a modelling scenario). Not necessarily a scientific authority.
3. *Mediates debate*: tweet considers competing evidence or links to issue-neutral source (e.g. news, policy paper).
4. *Partisan stance*: tweet takes an activist or partisan stance on a particular issue or suite of issues.
5. *Promotes solutions*: tweet promotes practical solution (e.g. commercial publicity, government programme, grassroots initiative).
6. *Transgressive*: tweet denounces authority or questions legitimacy of particular CDR-related assessments or proposals (e.g. radical activist, conspiracy theorist, independent researcher).
7. *Other* – idiosyncratic publicity on afforestation or BECCS e.g. job adverts.

The two authors applied these categories independently to the samples of land-related tweets and then compared results. Where contradicting categories were identified the cases were discussed and either corrected, if it was agreed that an error had been made, or highlighted as a case that challenged the typology (categories were agreed for 95% of BECCS tweets and 97% afforestation tweets). Our approach to the use of categorisation is therefore as a controversy heuristic as well as an approach to ordering information. As our analysis highlights, there appeared some obvious cases of tweets that were not easily reducible to a single category. We also note that within a given category tweets could articulate more-or-less pluralistic stances towards the actors, evidence or solutions relevant to CDR e.g. tweets coded '*Promotes solutions*' could promote multiple policy measures, technologies and lifestyle changes or, conversely, a single innovation.

Mapping afforestation and BECCS-related issues with CDR researchers

The interviews involving the researchers were in various ways porous spaces of interaction. The participants in our study related to us intellectually as social scientists but also in organisational terms as colleagues involved in an interdisciplinary scientific assessment project. Early on in the project, for instance, we had circulated the list of query terms that were being tracked on Twitter to project members and invited feedback on the query design. Most participants had also attended quarterly project meetings where we presented preliminary insights and given feedback. And, we had at various points engaged in discussion about the aims and outputs of the collective assessment. By the time of the interviews, most participants were therefore both familiar with the aims of our research and, to varying degrees, had engaged in some form of intellectual exchange with us. Their responses to interview questions are therefore not only those of researchers defined only by their discipline or expertise but those of colleagues involved in a common interdisciplinary assessment process who, by design, hold a variety of (sometimes competing) perspectives on the feasibility of afforestation and BECCS and how it should be defined and assessed.

The researchers' views about the value of Twitter for public engagement did not neatly map onto user/non-user distinctions. Of the twelve researchers interviewed, seven had Twitter accounts which were predominantly used in a professional capacity. While several users and non-users suggested the platform had potential to facilitate public engagement with topics like CDR, scepticism about the value of Twitter for public debate was prominent among both users and non-users. Notably, none of the researchers with accounts regularly engaged in interactions on the platform beyond publicising their own work. In line with studies of climate change on Twitter (Pearce et al., 2019), most researchers approached the platform primarily as a medium of science communication rather than an interactive setting of debate and issue formation. However, the challenge of mapping researchers' views about Twitter onto their status as users/non-users suggested that participation on the platform was rarely simply a personal choice. Indeed, both users and non-users highlighted a range of institutional and professional rationales, or conventions, relating to the widespread use of the platform among academic researchers.

In response to questions about the location of public debates on afforestation and BECCS (i.e. an open question that was not specific to Twitter), the researchers articulated a variety of ways in which publics can engage with CDR assessments. Researchers' answers sometimes offered competing constructions of the public to which their assessments are addressed. For instance, the account below, given by R2, demarcates public issues from the "critical issues" addressed by experts and stakeholders:

> The mechanisms which will drive change to afforestation and BECCS are going to be between government, the energy industry and landowners. So that for me is where I see some really critical issues coming to light. Which is a bit different from some of the public issues that I think yourself and Jason were interested in. (R2)

Such an account arguably forecloses more pluralistic accounts of issue formation in assessment processes, such as articulated by R5 below:

> You could say the ways publics are engaging with CDR is very different. Industrial CDR tends to get a lot of traction in the press, partly because the developers are often looking for heavy capital investment and start-up investment. By contrast, issues relating to nature-based solutions play out at quite specific place locations and contexts, so they don't flare up in the same way. (R5)"

While we refrain from attributing positions to individual participants, in general those participants whose answers could be identified more closely with the first position tended to be more expressly critical of the unrepresentative nature of Twitter. In contrast, those participants adopting more pluralistic positions on issue-formation tended to view the partiality of Twitter in experimental terms rather than as a limitation for public engagement with scientific assessments. In line with the prominent scepticism about Twitter amongst the researchers, the first position appeared much more prominent in the interviews than the latter.

By engaging participants with the dossier and the co-hashtag networks we aimed to test contrasting visualisations of issue dynamics on Twitter: the dossier visualising a series of ranked lists based on aggregated measures (e.g. retweet frequency), the co-hashtag networks as visualising relations between heterogeneous issue-terms. However, such contrasts appeared less significant (insignificant in some cases) in the responses of interview participants than those drawn between afforestation and BECCS publics.[9] Partly an effect of our interview design, the participants spent far more time engaging with the dossier than with the co-hashtag visualisations. As we highlight below, many (though not all) struggled to engage with the visual complexity of the co-hashtag networks. Because the ranked lists in the dossier offered a formal and immediate means of comparison, this material appeared the primary basis on which participants drew contrasts between afforestation and BECCS publics. These contrasts were often made in the guise of informal remarks or personal reflections. For instance, many participants described their feelings about the lists of user accounts or used evaluative language, like "positive", to characterise the sentiments expressed by retweeted posts or hashtags. This kind of interview speech does not therefore represent strict analytical statements of interpretation. Instead, we treat the contrasts between afforestation and BECCS publics articulated in the researchers' engagements with the visualisations as propositions about distinctive platform-based public spheres, or 'Twitter-spheres' as we term them (see Table 1), that can be empirically tested.

In what follows we first briefly outline the thesis of distinctive afforestation and BECCS Twitter-spheres. We then analyse how these contrasting Twitter-spheres might partially account for the struggles experienced by participants' in identifying issues and detecting controversy in the visualisations. Finally, we test the Twitter-spheres against a sub-sample of tweets addressing land-related issues, which were qualitatively analysed and compared using a typology distinguishing repertoires of public assessment (outlined in the methodology).

Constructing afforestation and BECCS publics as Twitter-spheres

The construction of these two Twitter-spheres, represented in Table 1, is necessarily crude as a representation of participants' responses to the visualisations. The contrasting Twitter-spheres are premised on oppositions, such as between the ratio of posts that are replies (i.e. an indicator of discussion), organisational vs. individual users, links to scientific sources vs. links to news sites, or posts that represent critical arguments vs. those that distribute acclaim.

In practice, the contrasts drawn by participants were rarely premised on such clear-cut oppositions and were often heavily caveated or reflexively advanced, for example:

> Contrary to the BECCS dataset, I think the afforestation dataset had much more of a green grassroots kind of vibe. I know that's probably not a very good way of putting it, but there are much more words like natural solutions and this kind of thing surrounding afforestation, with not too much emphasis on policy. (R7)

While the drawing of such contrasts comprised a central dynamic of the majority of interviews, participants also made observations about features of the visualisations that complicate strong oppositions and highlighted commonalities e.g. users common to both or retweets that address afforestation and BECCS together. In the case of the dossier material relating to BECCS several participants also highlighted internal contrasts between lists, for example:

Table 1. Contrasting afforestation and BECCS Twitter-spheres.

	BECCS Twitter-sphere	**Afforestation Twitter-sphere**
Overview dataset characteristics	Few posts, high number of posts replying to another	Many posts, low number of posts replying to another
Frequently posting users	Policy actors, Europe-centric	Companies and individual activists, globally distributed
Frequently linked-to domains	Science sources, climate policy organisations, industry sites	News sites, environmental organisations, business sites
Style of frequently retweeted posts	Critical, policy-focused	Distributing acclaim, climate change-focused
Co-hashtag networks	Climate policy-related hashtags, international organisations, acronyms e.g. conferences	Climate change-related hashtags, campaign slogans, country names, sustainability terms

> [The list of most frequent BECCS user accounts] looks an interesting potpourri, doesn't it? It looks like a mixture of the academic, the concerned or interested individual campaigner… a bit of the business space. […] I don't know what to make of that really because I think the messages, the most re-tweeted messages themselves [don't reflect this]… you would expect this set of most frequent posters to represent a more diverse set of views, and presumably they do, they've just not been re-tweeted! So, the magic of Twitter is picking up one pole of what must be a more, a more mixed set of… positions. So, I'm encouraged in short by the poster list… but, it doesn't reflect in the resulting dominant discourse. (R6)

Such distinctions at once illustrate the nuanced ways in which participants engaged with the material but also highlight how latent imaginaries of the platform, and the processes by which material posted gains public relevance, were often implicit in responses. Notions like "dominant discourse" here imply that it is by aggregation of retweets that a post becomes discursively powerful on the platform. Such imaginaries are significant given that aggregative metrics of engagement are widely deployed by platforms to establish public relevance (Marres, 2015), such as Twitter's Trending algorithm, and which our issue mapping approach was precisely designed to push back against.

The afforestation and BECCS co-hashtag visualisations provided to the participants each comprised a single, visually complex, network (see Figures 2a and 2b). Table 2 (below) shows the most highly connected hashtags in the networks provided to participants (coded versions of the network visualisations can be found in figures 2a and 2b in section 3).

Responses to the networks varied but often appeared shaped by the prior discussion of the material in the dossier. Some participants suggested the networks were too complex to meaningfully engage with and it is notable that two participants abstained from venturing interpretations of the visualisations, instead suggesting that further quantitative reduction of complexity would be required for such a task (e.g. applying a clustering algorithm). The latter responses highlighted tensions in the network style of visual presentation which could be interpreted as homogenising relations between hashtags (e.g. a semantic network of relations between words) as much as mapping relations between heterogeneous issue-terms and material-semiotic entities (see Marres, 2015). Indeed, the above tables showing most highly connected hashtags might suggest some dimensions of heterogeneity. The BECCS network, for instance, includes broad thematic hashtags, such as #climatechange, an organisation, the #ipcc, conference names, #cop24 and #cop25, a reference to corporate social responsibility, #esg, and a campaign slogan, #axedrax. A number of participants noted the challenge of interpreting the meanings of hashtags in both networks, high-

Table 2. Ranked list of most connected hashtags appearing in the afforestation and BECCS co-hashtag networks.

BECCS co-hashtag network[10]			**Afforestation co-hashtag network**		
Hashtag	**Number of tweets containing hashtag**	**Number of links to other hashtags**	**Hashtag**	**Number of tweets containing hashtag**	**Number of links to other hashtags**
climatechange	122	134	climatechange	683	781
climateaction	43	105	climate	182	349
ipcc	49	86	carbon	104	256
cop24	22	77	climateaction	134	240
trees	11	75	environment	88	205
climate	56	56	co2	85	202
netzero	103	52	sustainability	55	151
esg	8	50	globalwarming	54	141
cop25	17	48	nature	37	140
axedrax	4	47	biodiversity	41	127

lighting the presence of acronyms and specialist terms, notably in the BECCS network. Platform-specific dynamics are also arguably evident in the table, with several of the highly connected BECCS hashtags appearing in relatively few tweets (#axedrax appears in only 4 tweets), their visibility here an artefact of a user technique of maximising the number of hashtag within Twitter's character limits, potentially a strategy attempting to maximise the visibility of the post via the platform's popularity-based algorithms (Rogers, 2013) rather than for connecting content to a specific cross-cutting topic.

A variety of participants contrasted the network visualisations in a similar manner to the material presented in the dossier, for example:

> What really emerges for me quite strongly by looking at the BECCS hashtags map is the prominence around climate change, around kind of embeddedness or discussions of BECCS within scientific circles like the IPCC and related conferences … [it's] more technological orientated conversations within national strategies around decarbonisation... Whereas, if I look at the afforestation one what I see is still a kind of prevalent framing around climate change and potentially climate change mitigation but, it's considering more the characteristics of forests, what they provide, things about carbon absorption, the additional cultural benefits or ecosystem service benefits that they provide and their embeddedness within more complex and wider conversations around sustainability as well.(R14)

Such accounts not only articulated thematic contrasts but also some distinctive ways in which hashtags can perform as publicity devices, for instance to connect to a "conversation" or promote a slogan.

Notions of the public were invoked (sometimes latently) by researchers to explain contrasts between afforestation and BECCS visualisations. For example:

> There were some [afforestation retweets that say] "keep calm and plant a tree", and another one and another one … you know, no-one's going to argue with that, it's easy to put out there whereas if you go, "keep calm and make a BECCS plant", people are going to kick off. (R11)

The use of notions of the public to explain contrasts between afforestation and BECCS visualisations was neither shared by all researchers nor ventured in a schematic way. While often appearing partial or informal, they nonetheless highlight how strongly evident the contrasts between afforestation and BECCS publics appeared to some participants, to the extent that their differences warranted explanation. Such explanations highlight how the afforestation and BECCS Twitter-spheres we identify here could be said to correspond to distinctions between natural and engineered CDR i.e. distinctions not only between methods but also, more normatively, to differences between perceived 'naturalness' and social acceptability of CDR (see Cox et al., 2020).

How Twitter-spheres obscure traces of controversy

One of the most striking results from the interviews was that participants overwhelmingly answered "no" to the question: "does this material on BECCS and afforestation raise any feasibility issues that you were previously unaware of?".[11] The interview design was intended to begin by discussing the feasibility issues arising from each participant's research on afforestation and BECCS as a basis for subsequent exploration of the visualisations. However, such assumptions of continuity between research problems and public issues appeared highly questionable. While the dossier and network visualisations were often characterised as "interesting" and "surprising", when the question was explicitly posed the researchers appeared to reject the notion that the visualisations raised substantive issues that might have consequences for their research assessing the feasibility of afforestation and BECCS.

While many participants struggled to identify issues relevant to their research, they also offered divergent evaluations of the visualisations. Studies of scientific discourse (Gilbert et al., 1984) have long shown that the appearance of epistemological consensus can be supported by multiple empirical justifications. In examining participants' responses to a range of interview questions we found sometimes competing, though equally plausible, ways in which separations were drawn between scientific concerns about the feasibility of afforestation and BECCS and public issues.

The most frequently retweeted post in the BECCS dataset provides an illustration of divergent responses between researchers, who otherwise agree that the visualisations failed to problematise establish issue-framings. The tweet both publicised and linked (indirectly via a media report) to a journal article, involving researchers participating in our interviews, titled: *Land-use emissions play a critical role in land-based mitigation for Paris climate targets*. The tweet reads:

> Trying to tackle climate change by replacing forests with crops for bioenergy power stations that capture carbon dioxide (CO2) could instead increase the amount of CO2 in the atmosphere, scientists say. #ActOnClimate #ClimateChange https://t.co/pDqDFkSzOI. (Dawson, 2018)

This tweet was not authored by the researchers on our project but rather by a user describing themselves as a "climate change communicator" and who, notably, also authored the most frequently retweeted post about afforestation in the dossier (a fact that might suggest the well-documented 'Matthew effect' in science can also apply to platforms like Twitter, see discussion in Marres, 2015).

As the most frequently retweeted post in the BECCS dataset, this tweet was highlighted or discussed (to varying degrees) in the majority of interviews. However, while the authors of the journal article it links to both recognised, unprompted, that the tweet was referencing their research, no other participants recognised this fact. Four participants offered an evaluation of the tweet as either "critical" or "negative". In some interviews we drew participants' attention to the connection between the tweet and their colleagues' research and asked whether learning this changed their evaluation of the tweet. Although none of the researchers revised their initial evaluation of the tweet, this question did elicit a variety of justifications that can be compared. One researcher, for instance, suggested the tweet represented a partisan interpretation that took some of the claims of the paper out of context:

> **R12**: The trouble is that I think they make a lot of uninformed comments about bio-energy being intrinsically more dirty than coal and I think they come from that perspective. Whilst it's true that a bio-energy power station will emit more carbon per megawatt hour, they don't take into account the growing of the material… so they don't consider the whole lifecycle.
>
> **Interviewer**: Does it make a difference that the link in that tweet is to a story that reports a paper published by [researchers], from our project?
>
> **R.12**: No [laughs]. Because it's probably taking something out of context. [...] I think if you go to [the] paper, for example, they discuss it at length, the circumstances over which it might not be very good and the circumstances at which it may be good but overall, the paper is for BECCS rather than against BECCS, so to speak.

The researcher's original objection to claim in the tweet is here justified on the basis that the nuance of the original research is lost in its translation in media reporting, and in the subsequent tweet, enabling the paper to be appropriated to support partisan arguments against BECCS. The researcher's suggestion that the paper is "for" BECCS here highlights the challenge of positioning assessment research in relation to systemic criticism of CDR in climate policy (i.e. that approaches promoted as CDR may be in fact lead to net increases in CO2 emissions). Rather than reading the researcher's comment as a statement of partisanship we suggest dichotomies between constructive and critical approaches to CDR are better understood as artefacts of policy-driven approaches to scientific assessment.

Other justifications for similar appraisals of the tweet, however, differed in where they located the causes of the partial interpretation of the research. One focused on limited public access to academic journals. Another related the partial reporting of the paper to the focus on "headline grabbing" in contemporary academic research. In such responses, the causes of partial reporting of CDR research lay not only in the particular motivations of Twitter users or the discursive limitations of the medium but also in the publishing and publicity practices of researchers and scientific institutions. By contrast, a researcher who did not evaluate the tweet as critical or negative highlighted that it could be read as raising scientific and policy questions about the challenge of assessing CDR approaches like BECCS and afforestation independently, when they might potentially compete for land.

Indeed, several interview participants explicitly foregrounded the absence of land and land use issues. For instance:

> [The visualisations] didn't seem to tell you anything about the land debate whatsoever … in terms of policy design, agri-environment, farmer succession, longevity in the way in which we try and do this … all those real issues we're trying to get afforestation going, it doesn't really come out in here. (R2)

As illustrated in the discussion of the most retweeted BECCS post above, land-related research issues were potentially detectable in the visualisations, however, participants struggled to identify them as such. As a concern for scientific assessments of both afforestation and BECCS, land-related issues therefore provided a case with which to test the Twitter-spheres constructed from the interview responses.

A test of the afforestation and BECCS Twitter-spheres

In order to test the construction of afforestation and BECCS Twitter-spheres emerging in the responses of the researchers we analysed samples of tweets about land use (see methodology). The queries for [land] and [landuse] returned similar sample sizes (as a proportion of each dataset, see methodology) suggesting that land-related issues may not support strong contrasts between afforestation and BECCS publics (as the Twitter-spheres in Table 1 might otherwise imply). Our test compared issue dynamics in these samples both by categorising the tweets they contain and by coding the hashtags in these tweets onto the network visualisations.

Categorising the land-related tweets against the typology (outlined in the methodology) affirms some aggregate contrasts between public expressions about afforestation and BECCS on Twitter (see Fig.1). The most prominent dynamics in each sample could be said to correspond to contrasts identified in the Twitter-spheres table (above): almost 40% of land-related tweets in the BECCS appear to mediate between positions in policy debates while almost 35% of land-related tweets in the afforestation sample promote solutions. In relation to the Twitter-spheres, this contrast could be seen to affirm some aggregate differences between afforestation and BECCS publics and social realities of CDR.

However, attending to the antagonistic modes of engagement[12] – represented by the categories: '*Contests a fact*', '*Adopts partisan stance*' and

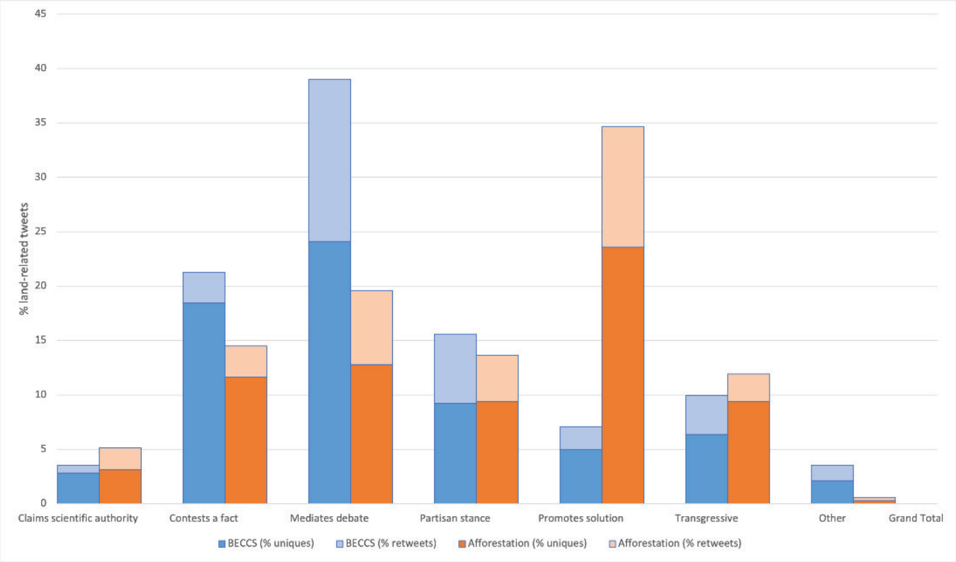

Figure 1. Comparison of land-related tweets in afforestation and BECCS datasets, tweets categorised by typology of repertoires of public assessment (see methodology).

'*Transgressive*' (which together account for 40% of afforestation tweets and 47% BECCS tweets) – complicates suggestions that contrasts between these samples can be explained by inherent properties of afforestation and BECCS as CDR methods (e.g. as simply reflecting different 'technology readiness levels' (c.f. Nemet et al., 2018). This point can be illustrated with the example of a tweet that challenged the authors' categorisation typology:

> Great columm from @Richard_Dixon on #bioenergy with carbon capture & storage: "BECCS as an idea [...] has a terrible reputation, mainly because of the huge areas of land that would be needed [...], but also because, done wrong, BECCS would actually make climate change worse."(Biofuelwatch, 2020)

In this tweet the activist group Bioenergy Watch refers to a report in the newspaper *The Scotsman* authored by the director of Friends of the Earth Scotland about potential developments of BECCS in Scotland. Based on the user, one author categorised the tweet as *Partisan Stance* while the other categorised it as *Mediates Debate*, based on its link to a newspaper source. While the contradictions this tweet raised for our typology were much less apparent in the majority of the corpus, they nonetheless highlight the ways in which digital interactions recorded by platforms like Twitter can complicate, even confuse, institutional and actor-based categories e.g. in this case between mediators and interest groups. The exercise of categorisation affirms that, in the aggregate, contrasting topic dynamics are prominent in the afforestation and BECCS samples. However, we also see how, in this example, controversy dynamics may be obscured in processes of aggregation.

Tensions between aggregate methods of analysis and the detection of controversy dynamics surface prominently in the coded co-hashtag network visualisations.

In aggregate terms, there are clear differences between the proportion of land-related hashtags in each network: in the afforestation network, 11% of hashtags appear in land-related tweets (though only 5% are unique to land-related tweets), in the BECCS network 6% of hashtags appear in land-related tweets (though only 1% are unique to land-related tweets). However, a close visual analysis arguably suggests not dissimilar patterns of hashtag use in both. In both networks land-related hashtags are polarised between those nodes with very high numbers of links in the network and those with very low numbers of links. The nodes with the most links in each network represent hashtags that also occur in many tweets not relating to land e.g. #climatechange. Hashtags occurring only in land-related tweets often appear in weakly connected clusters of hashtags or on the periphery of the network. Common to both networks, then, is a common pattern in which hashtags are used to connect land-related tweets either to popular climate and environmental

Table 3. 10 most highly connected hashtags in land-related tweets in afforestation and BECCS datasets.

BECCS co-hashtag network			**Afforestation co-hashtag network**		
Land-related hashtags	**Number of tweets containing hashtag**	**Number of links to other hashtags**	**Land-related hashtags**	**Number of tweets containing hashtag**	**Number of links to other hashtags**
climatechange	122	134	climatechange	683	791
climateaction	43	105	trees	152	365
ipcc	49	86	climate	182	354
cop24	22	77	carbon	104	260
netzero	103	52	climateaction	134	242
cop25	17	48	environment	88	207
negativeemissions	35	42	co2	85	204
naturebasedsolutions	10	26	deforestation	84	202
ghg	8	18	sustainability	55	154
cdr	5	17	globalwarming	54	143

Figures 2a & 2b. Afforestation (2a) and BECCS (2b) co-hashtag networks, showing co-occurrence of hashtags in tweets. Colour coded for land-related tags: tags unique to land-related tweets (green), tags shared by both land-related tweets and non-land-related tweets (red), tags not appearing in land-related tweets (white). High resolution images available on request.

policy terms (see Table 3) or, conversely, to very idiosyncratic issue-terms e.g. #friendsofhaiti2010, #missingpathways.

Our test offers some reasons for why the researchers may have struggled to detect controversy in the visualisations and identify issues. Qualitatively analysing the tweets highlights how methods of aggregating digital records may obscure controversy dynamics, such as the confusion of actor categories. Methodologically, this illustrates the contingency of platform-focused categories, such as between users and content, and how they can become reified in aggregate contrasts, such as between afforestation and BECCS Twitter-spheres. Coding the co-hashtag visualisations also makes clear why land-related issues would have been difficult to detect in the co-hashtag network visualisations, since land-related tweets tend not to be publicised as such through hashtags. The results of this test therefore raise questions about the extent to which platform-specific categories and devices, like hashtags, can be repurposed as methods for bringing scientific assessments into closer relation with their publics. We now offer some reflections that follow from this finding.

Discussion and conclusions

The kinds of issues that emerge on digital platforms like Twitter have typically been excluded from consideration in scientific assessments of climate change on the basis that they are partial, both in the sense that actors are often self-selecting or unrepresentative of societies and that the knowledge claims they raise cannot be easily validated. Climate change assessments, like those undertaken by the IPCC, are typically concerned with the representation of publics that can legitimate decision-making processes or provide assessment institutions with the basis for demarcating policy stakeholders from lay audiences. However, as climate change assessments shift from addressing the causes of global warming to evaluating solutions like CDR the expansion of knowledges, expertise and concerns relevant to assessments and the drawing of boundaries between climate science and politics – as well as distinctions that often structure public participation in assessments, such as between 'critical' issues and public issues or between stakeholders and 'general publics' – is likely to become more controversial. Attempts to construct CDR as a topic of scientific assessment are therefore unlikely to settle such controversy, and rather more likely to proliferate the sites of engagement with climate change research and settings where the agendas of climate change assessments, and the issues they address, are discussed and contested. This study has sought to examine the extent to which digital media-technologies, like social media platforms, can stage assessment-related controversies and bring climate assessments into closer relation with public issues. By way of discussion and conclusion we now draw out three main areas of insight from the study on: relations between climate/CDR assessments and their publics; prospects for bringing mapping methods into critical proximity with processes of interdisciplinary assessment; and implications for digital methods and controversy analysis.

First, the issue mapping experiment presented in this paper developed within an assessment process organised around large quantitative CDR targets and, more broadly, prevalent framings of public engagement as a problem of legitimating CDR policy options and securing the social acceptance of technological innovations (Waller et al., 2020). Involving the researchers in the issue mapping process did not return a neat slate of issues in ready-made propositional form relating to the afforestation and BECCS and the assessment of CDR feasibility. Instead, we found many participants engaged with the visualisations by drawing contrasts between afforestation and BECCS publics, which we have characterised here in terms of their platform-specify, as Twitter-spheres. The contrasting Twitter-spheres outlined here arguably correspond to well-established, competing problem-framings of CDR, namely: afforestation as a 'natural solution' to climate change and BECCS as 'geoengineering' (Bellamy and Lezaun, 2017; Cox et al., 2020). Quantitative CDR assessments have predominantly developed around techno-economic problem framings: treating both afforestation and BECCS as 'technologies' and removals of atmospheric carbon dioxide as exchangeable between them (see discussion in Nemet et al., 2018). While 'natural solutions' to climate change are often presented by their advocates as normatively desirable alternatives to 'geoengineering', the methods used to assess their feasibility in practice differ little, both privileging technological and economic framings (broadly conceived e.g. to include ecosystems services) of feasibility issues (Waller et al., 2020). The contrasting Twitter-spheres we identify here may therefore map onto contrasting policy discourses relating to CDR but – as highlighted in the researchers' struggles to identify issues relevant to their research – it is not clear that such differences necessarily problematise predominant techno-economic approaches to assessing the feasibility of afforestation and BECCS or framings of CDR as a solution to governing climate change.

Second, our study offers insights on the challenges and potentials for participation experiments that seek to bring experimental methods for mapping publics, participation and public issues into critical proximity with organised assessment processes. Rather than limit these reflections to prescriptive metrics of successful 'participatory assessment', in taking a more experimental and reflexive approach to participation (Chilvers and Kearnes, 2016; Lezaun et al., 2016) we attempted to attend to the different productivities, openings and closings generated through the issue mapping process. The challenges experienced by the participants in detecting assessment-related controversy and identifying issues has provided the primary occasion for exploring the roles digital methods can play in both engaging and disengaging assessment researchers with public issues. The researchers' overwhelming rejection of the notion that the visualisations raised issues they might previously have been unaware of could be seen as a failure of the experiment to significantly problematise pre-existing framings of the feasibility of afforestation and BECCS. In some public engagement with science approaches, such findings might be interpreted as evidence of 'deficit' models of (Twitter) publics lacking the cognitive resources to engage with the topics of scientific assessments (see discussions in Irwin and Michael, 2003). Conversely, from more critical traditions, it might be tempting to suggest a social science 'deficit' on the part of the participants who did not attribute methodological significance to distinctions between the aggregated lists and co-occurrence network visualisations. However, since almost all interview participants acknowledged some degree of interplay between assessment problems and public issues during the interviews neither of these interpretations seems particularly illuminating. Instead, our analysis has examined the researchers' struggles to identify issues as revealing the partialities of our experiment in creating critical proximity between the assessment researchers and the assessment's publics. Where the visualisations had been designed to present the researchers with a heterogeneous view of the topic of their research, the ease with which some interview participants distanced their research from the topics raised in the visualisations we assembled suggests that digital methods can (potentially at least) just as easily be deployed to create distance as proximity between assessments and their publics.

Finally, then, digital methods research is not only a domain of methodological experimentation but is an approach relevant to questions about how assessments of controversial topics, like CDR, gain legitimacy in digital societies as *scientific* assessments. STS research has long highlighted the epistemic ambiguity of knowledge produced by assessments of climate change (Jasanoff et al., 1998), which is arguably amplified in assessments of topics like CDR (Beck and Mahony, 2018). Yet, as our analysis highlights, such epistemic ambiguities did not necessarily manifest explicitly in the interview participants' engagement with the visualisations. Indeed, for some researchers, the visualisations appeared to provide an empirical basis for demarcating scientific from non-scientific issues, enabling them to *dis*engage from the problem of the interdisciplinary assessment's public. Despite platforms like Twitter being a site where scientists frequently post and engage with each other, the traces of interaction recorded may, it seems, easily be dismissed as having little or no relevance for the practice of scientific assessment. In the interviews we find controversy most clearly detectable in the divergent justifications offered for otherwise common appraisals of the visualisations (e.g. the most retweeted BECCS post). This finding makes clear why attempts to evaluate public debates on platforms based on analysis of data collected from APIs alone may fail to sufficiently engage with the multivalence of digital records, the competing ways in which platforms are discursively constructed as sites of engagement and the situations in relation to which expressions on them gain public relevance (Marres, 2015). Submitting the question of Twitter's public relevance to participatory inquiry, our study highlights both the value of an interactive method like interviewing to detecting traces of controversy as well as some of the different ways in which (digitally-mediated) controversy comes to be framed out assessment processes. While the researchers' engagements with the visualisations aggregated from tweets about afforestation and BECCS may not have yielded a slate of CDR-related issues amenable to expression in propositional form or thematic differentiation, the interviews demonstrated that such visualisations hold potential for facilitating discursive interaction and reflexivity between interdisciplinary researchers, surfacing divergent imaginaries of assessments and their publics. Far from breaking with qualitative research traditions in STS, we suggest that experiments such as ours demonstrate the value of mixed 'quali-quantitative' approaches (Moats, 2021) for controversy analysis and practicing critique through participatory inquiry.

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Notes

1 We elaborate the concept of digital traces in the following section.

2 Tweets were collected using the DMI-TCAT software (Rieder and Borra, 2014) which connects to Twitter's Streaming API. Lists of query terms for each dataset and tweet IDs are available in the supplementary material.

3 The interdisciplinary assessment in which this research was undertaken focused on assessing the "real-world feasibility" of afforestation and BECCS, linked to a specific funding programme on greenhouse gas removal. See: https://www.ukri.org/our-work/browse-our-areas-of-investment-and-support/greenhouse-gas-removal-from-the-atmosphere/ (accessed 17/03/2022).

4 These materials can be made available on request.

5 Table2Net software developed by Science Po's medialab, available at: https://medialab.github.io/table2net/ (accessed 04/01/2021).

6 Mini-VAN software, created by the Public Data Lab, can be accessed here: https://minivan.publicdatalab.org/ (accessed 04/01/2021).

7 Our initial research design had proposed to engage participants in face-to-face analysis of the network visualisations. Due to the Covid-19 pandemic, the research design was adapted to an online environment.

8 Spaces were included in the query to avoid returning results such as Poland, Iceland etc.

9 For this reason, in what follows we use the term "visualisations" to refer to both the aggregated lists in the dossier and to the co-hashtag networks.

10 This list of hashtags has been edited to remove those resulting from a query error during the first two months of data collection and therefore is not identical to that provided to the participants.

11 All participants asked this question answered: "no". Two participants were not asked this question.

12 Antagonistic modes of engagement have been widely valued for bringing to light the more controversial dimensions of technical topics and contributing to processes of issue formation (see discussion in Callon et al., 2009; Lezaun et al., 2016; Pielke, 2007).

Living Well with a Healthy Weight: A Case of the Body Mass Index as a Governing Practice

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Abstract

This article troubles the intervention of the Body Mass Index (BMI) calculator from the National Health Service (NHS) website (www.nhs.uk) through a situated experiment involving my body. Specifically, it demonstrates how the assemblage of online location, the BMI calculator, and my male body are entangled in generating political effects for my healthy eating, healthy weight and wellbeing. By exploring the NHS website's online intervention tool, I present how evidence-based repertoires allow the production of collateral realities of my body governed by my BMI result.

This provokes a discussion about how different effects of numbering governance are possible through applying care-based intervention practices and through a situated intervention. One response to the outcomes of this analysis might be the possibility to change the logics and mechanics of an Internet-based intervention from exercising specific, fixed and standardised norms to more carefully enacting care as situated and relational.

Keywords: the body mass index, intervention, situated experiment, male body

Introduction

A sociological scholarship has theorised the Body Mass Index (BMI) as a governing object entangled in medicalisation leading to an 'obesity epidemic' (Fletcher, 2014; Monaghan, 2007); and a tool of institutionalised power (Colls and Evans, 2010; Evans and Colls, 2009). Critical obesity and fat studies accounts on the BMI have highlighted the detrimental effects of "promoting weight loss towards the BMI measure" (Dickson, 2015: 474), its co-construction of the obesity epidemic and over-dramatization potential of the BMI index (Guthman, 2013), the inability of the BMI to account for complex socio-cultural arrangements (Burkhauser and Cawley, 2008) and a patient distrust in the BMI score in relation to the measures of obesity (Kwan, 2012). Furthermore, critical digital health studies scholars conceptualised the BMI calculator as a token of broader digital health, self-tracking, or quantified-self initiatives (Lupton, 2013, 2016; Sanders, 2017). Generally, the BMI index facilitates and underpins the oppressive 'weight anxiety' (Dickson, 2015) and social exclusion of people that are 'too fat' (Monaghan, 2007). In that respect, Greenhalgh (2015, 2016) claims that in the US 'war on fat' has been transformed into the national spectacle mobilizing medical professionals, educators, scientists, families and fitness industry.

This article adds to these discussions taking an inventive turn from digital health and obesity and fat studies scholarship, conducting a situated and embodied experiment with the BMI online intervention via the National Health Service (NHS) website. This is achieved by tinkering and intra-acting, instead of merely following with the BMI device to offer innovative ways of doing an online intervention and care. By extension, I build on Zuiderant-Jerak's (2015) argument of social sciences struggle between 'detachment and engagement' from the research subjects.

The Body Mass Index

While the BMI is not the only algorithm used to quantify bodies in relation to weight or mass (Kouri et al., 1995; Schutz et al., 2002), it is one of few quantification tools to have been recognised, standardised, and implemented on a global scale (Fletcher, 2014).

A recent report by the Royal College of Psychiatrists in the United Kingdom reinforces the relevance of the BMI for public health, signposting the BMI number as an entry point for anorexic patients to receive medical services (Marsh, 2019). Relevantly, The United Kingdom and The United States launched national public service announcement campaigns to inform, fight, prevent and reduce the levels of obesity (Greenhalgh, 2012, 2015, 2016; Monaghan, 2007). Greenhalgh situates the BMI score as a governing object for young students life goals. She links 'war on fat' with increasing number of eating disorders among students who obsessively want to maintain a proper BMI (Greenhalgh, 2016: 549). Similarly, Gard and Wright's (2005) argue that the BMI metric inadequately accesses risks of obesity by amplifying the concern about body weight and solidifying the 'obesity epidemic'.

Aligning with biomedical, evidence-based approaches, the NHS has assigned a specific section of its website to provide an online space for a digital health intervention using the BMI device. The NHS website, which hosts the BMI calculator, is an instance of a nation-wide, online health intervention platform that offers self-care remotely through a digital device. As one of the biggest public health care providers globally, the NHS is particularly influential in shaping and impacting public opinion (Dayan et al., 2018).

The BMI calculator, and the NHS website, which hosts it, are intertwined in an assemblage of intervention in relation to weight and body image as a public health concern. The assemblage enrols the online calculator, my body, eating practices, dieting, fitness routines, health risks, and quality of life. Furthermore, the BMI device, as a tool of health intervention, connects with broader evidence-based medicine (EBM) approaches, which materialise health governance through standardisation practices, including calculation, intervention, policy, guidelines, and protocols (Berg, 1997; Hoeyer et al., 2019; Timmermans and Berg, 2003).

Taking the problematisation of the BMI as a force of governmentality (Dickson, 2015; Gutin, 2018; Metzl and Kirkland, 2010)I demonstrate how autoethnography can be utilized as a methodology to conduct public health research. My argument is structured around an application of Jacques Lacan's psychoanalytic theory which I see as supporting and extending a critical understanding of the so-called obesity epidemic and related issues. I argue that the body mass index (BMI, I conduct a situated experiment investigating how the NHS website and the BMI calculator intervene on my body. I propose a new perspective on tinkering through interfering with the tool and shaking up the mechanics of its intervention while travelling through an online location. I then trouble the governing practices of the BMI calculator by proposing an evidence-making intervention (EMI) as an alternative framework for enacting care through an online intervention.

Approach

Advancing the previous sociological work conceptualising the BMI as a social construct and an instrument of biomedicalization processes (Gutin, 2018; Nicholls, 2013)and obesity as a socially undesirable, stigmatizing construct opposing thinness as the healthy ideal. Less often considered is the role of body mass index (BMI and building on a material feminism approach (Warin, 2015), I am going to utilise new-materialism thinking (Barad, 2007; Haraway, 1998; Puig de la Bellacasa, 2017) to unpack the assemblage of numbers and Internet-based self-care. Conscious about the broad scope of new materialism approaches and their limitations I am particularly attuned to tinkering, intra-action and relational care as the guiding analytical tools. More over the chosen concepts build on and advance Haraway's (1998) notion of situatedness while developing Zuiderent-Jerak's (2015) proposal of situated intervention. The intervention through the BMI calculator is selected as the object for the analysis here because it entangles the implementation of self-care through a remote, digital device with the performance of routine checks and standards regarding body weight, and by extension, quality of life. This will trouble the 'remoteness' of the web-based device in relation to my body and show how tinkering with the BMI calculator affords an ontological disturbance of standardised norms and governing practices to offer a more careful way of delivering care.

Mindful of the vast literature on bio-metric, self-tracking, and wearable devices (Gardner and Jenkins, 2016; Pugliese, 2010; Rao, 2018), I approach the BMI as a springboard for an embodied and situated experiment through which I explore the NHS website and interrogate how this particular form of resource accommodates remote health interventions. I argue that the intervention through the BMI combines the logics of numbering and governing to produce ontopolitical effects (Mol, 2013) for 'good' weight, health, and life. That is, following Mol, the reality of the intervention is not preformatted, but it comes to be through practices. Therefore, it is open and multiple (Mol, 1999). Consequently, enrolling my body into this assemblage of practices allows disrupting the assumed remoteness of digital self-care by engaging with the device in-the-now. Hence, following Puig de la Bellacasa (2011, 2017) and Rosengarten and Savransky (2019) cues, through this analysis, I wish to provoke a discussion about how different effects of numbering governance are made possible through applying evidence-making instead of evidence-based intervention practices. I will propose that one response to the outcomes of this analysis might be the possibility to change the logics and mechanics of an internet-based intervention from exercising specific, fixed, and standardised ontonorms to more carefully fostering care as a situated intervention (Zuiderent-Jerak, 2015).

Therefore, I draw on Barad's (2007) notion of intra-action to map my entanglements between my body, the website, and the device. I understand intra-acting as continuous remodelling of the traditional concept of causality (Barad, 2007: 140) to disrupt the normative governing of the NHS website and the BMI device. By troubling the causal relations between the normativities of the BMI and my body, this experiment creatively engages politically through a research practice (Juelskjær et al., 2020). With the event of intra-acting, I claim that space (the website), time (here and now), and matter (my body) generate particular ontopolitical effects disturbing the causal relation between intervening, numbering, governing, moral edicts, and evaluation of my health and life. Thinking with intra-actions redefines how I, my body are becoming online, and offline in relation to the NHS supported online intervention highlighting how care could be done differently.

Then, my experiment constitutes an instance of Rhodes and Lancaster's (2019b) 'evidence-making intervention' (EMI). The term 'evidence-making intervention' is posited as a means to trouble 'evidence-based intervention' (EBI) by emphasising that interventions and standards are always implemented in situated practices involving controversy, fluidity, multiplicity, and difference. Lancaster and Rhodes (2020) propose to challenge how evidenced-based interventions are implemented in various sites and locations. They advance a framework that accentuates the "'transformations' which occur as health interventions are put to use, made to work and evidenced in local situated policies and practices" (Lancaster and Rhodes, 2020: 7). The situated experiment underpinning this paper constitutes an application of this novel approach. Additionally, they identify a '*within limits contingency'*[emphasis in original] (Rhodes and Lancaster, 2019b) in implementation science, which maintains an epistemological claim to interventions being 'evidence-based' across diverse contexts. Ultimately, realist-oriented approaches to 'evidence-based' intervention reproduce an underlying ambition of universalisation and standardisation as a means of health governance (Berg, 1997; Timmermans and Berg, 2003), which the NHS website hosting the BMI calculator also does. I follow Woolgar and Neyland (2013) conceptualising governing as an invisible form of ordering reality embedded and entrenched in mundane (invisible) objects.

In my analysis, I am positioning myself as a researcher situated in material-semiotic contexts (Barad, 2007; Haraway, 1998), which I define as spaces, realms, domains, realities where human and non-human objects are all enacted. Consequently, my own body is enacted by the assemblage of the website, the BMI, intervention, standards, governing, numbering, diets, workout plans, public health, nutrition, eating practices, obesity, eating disorders, and discourse of happy life. Those enactments generate and maintain new locations and realities, whereby my body is becoming together with my BMI numbers. Such a framework is inspired by inventive feminist studies approaches that recognise the embodied relations of researchers with their data, thereby transgressing the detachment from the body in the social studies of health (Ellingson, 2006; Harris, 2015; Sharma et al., 2009).

My approach to analysing the website is twofold. One is to attend it as a resource of Internet-based intervention that evaluates components of a healthy weight and living. The second is to take my body as a matter of the situated experiment, entangle it with the quantification practices while engaging with this online location. In the second part of the analysis, I will bring myself and my male body trajectories, experiences, situatedness, and measurements to receive my BMI result and explore further what that entails. Consequently, I will tinker with my numbers (body mass) and activity level to disrupt the presumed stability of the online intervention. The experiment will be conducted through travelling through and with the website starting from "Live well" (fig. 1) and affectively engage with the following subpages: "Eat well" (fig. 2), "Healthy body" (fig. 3), "Heathy weight" (fig. 4), "Manage my weight" (fig. 5) and "The BMI calculator" (fig. 6). My actions will be informed by the overarching aim to critically analyse the effects of tensions emerging between the implementation of 'evidence-based intervening,' the governing potency of the BMI, my body, and the quality of my life.

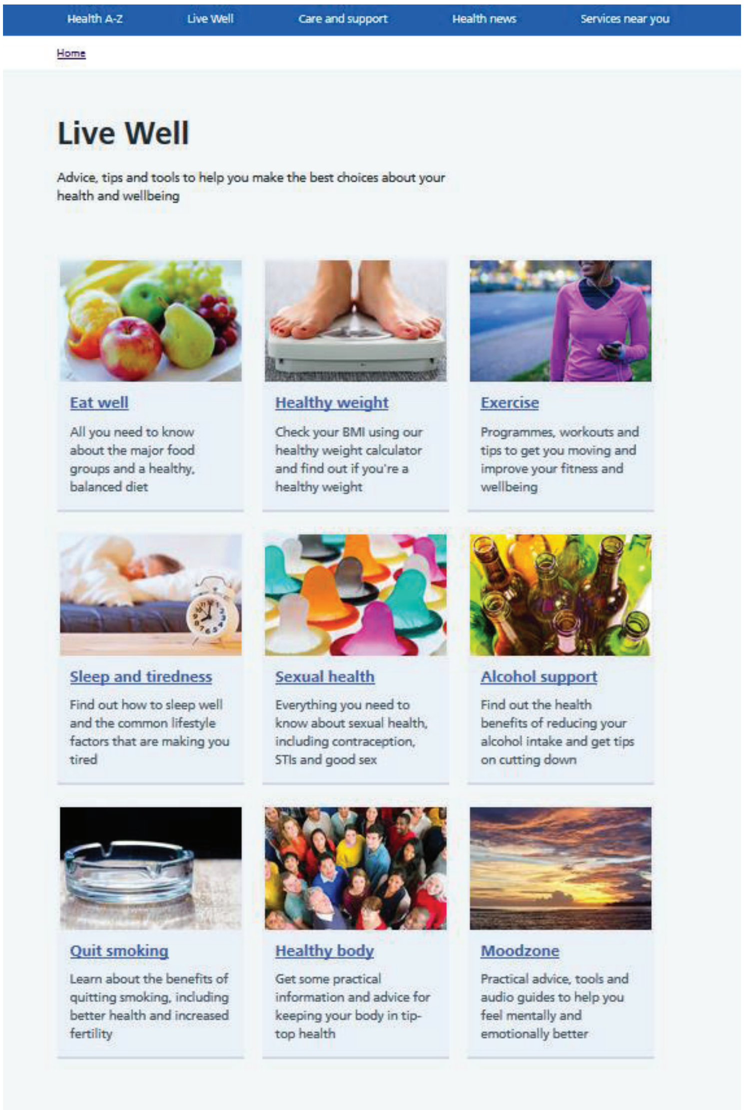
The NHS recipes for a "good" life

The travel across the online location starts from the exploration of the introductory "Live Well" page. Further, I follow the subpages that it activates relating to my healthy body, healthy weight, and healthy eating exploring them. Thus, I click the "Live well" tab on the website (fig. 1), and I am presented with the following results:

Three subpages – "eat well" (fig.2), "healthy weight" (fig. 3), "healthy body" (fig. 4) – directly relate to the above-mentioned debates on BMI, obesity, weight management, and healthy life. As a person with what might be described as an obsessive attitude towards my body shape and weight, the short descriptions attentively enrol me and my body into the cluster of discourses of 'major food groups,' 'healthy balanced diet,' 'healthy body,' 'tip top health,' 'healthy weight' and 'BMI calculator.' Exploring them further allows me to interrogate how exploring the online location governs me, my body, and my life "incidentally and along the way" (Law, 2012: 156).

'Eat well' assembles knowledge of food, food products, various types of diets, and eating practices. Questions generate uncertainty about my eating practices and my body mass prompting subsequent recommendations about what else is needed for me to be 'my best'. Thus, If I want to be 'my best,' the intake of five portions of fruit and vegetables becomes a moral obligation – to stay healthy and live well. Continuously, the bolded headline pinpoints 'a balanced diet' as a crucial ingredient of 'good' health and 'feeling your (*my)* best' (emphasis added). Therefore, instantly, I feel responsible for my knowledge about particular products and their influence on my body and the right and wrong combinations of those diets and recipes. I notice 'balance' as situated in the moment, affective expression (Dennis, 2019) that is the most valuable and desirable relation between me, my body, and food. Significantly, the entire category of 'balanced diet' orders my body to become in a certain way by specific means.

Food – through dieting - becomes politicised and entrenched into the discourse on health and wellbeing; a carrier of political and moral values; producer of realities and effects; and one of the places where governance of me is being done.



Health A-Z | Live Well | Care and support | Health news | Services near you

Home

Live Well

Advice, tips and tools to help you make the best choices about your health and wellbeing

Eat well
All you need to know about the major food groups and a healthy, balanced diet

Healthy weight
Check your BMI using our healthy weight calculator and find out if you're a healthy weight

Exercise
Programmes, workouts and tips to get you moving and improve your fitness and wellbeing

Sleep and tiredness
Find out how to sleep well and the common lifestyle factors that are making you tired

Sexual health
Everything you need to know about sexual health, including contraception, STIs and good sex

Alcohol support
Find out the health benefits of reducing your alcohol intake and get tips on cutting down

Quit smoking
Learn about the benefits of quitting smoking, including better health and increased fertility

Healthy body
Get some practical information and advice for keeping your body in tip-top health

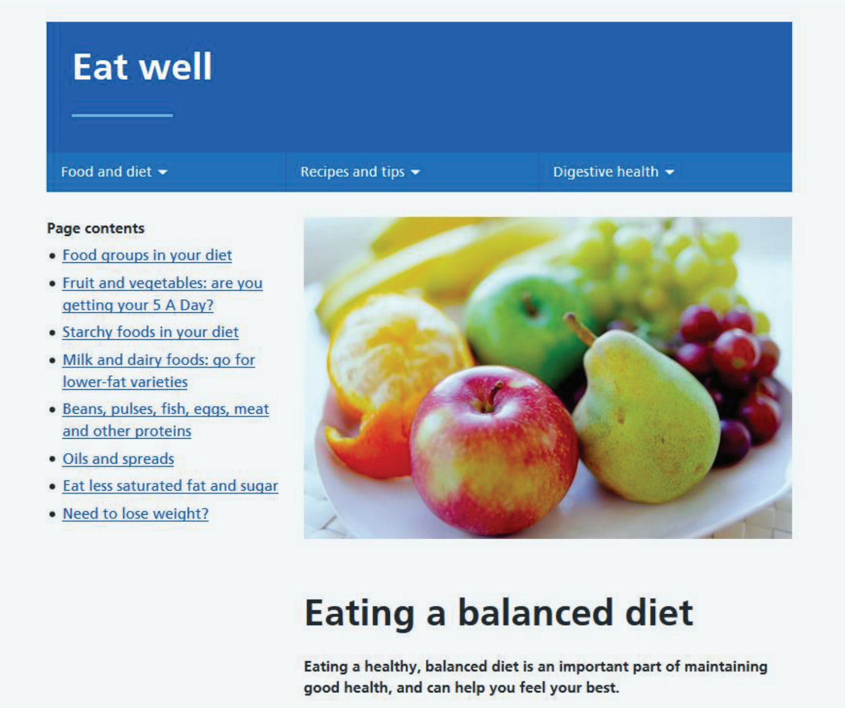
Moodzone
Practical advice, tools and audio guides to help you feel mentally and emotionally better

Figure 1.

The "Healthy body" location recommends ten practices that help maintain it, and for a person with body image issues, I am promptly interested in what they are and do. The category of 'Top 10' tips is subsequently evidencing and assembling advice for the healthy body pursuit. Food is enacted through smaller elements: fibre, saturated fat, '5 a day', salt, fish, alcohol and food products labelling. Consequently, all nutrition components become morally and politically significant through normative edicts. To verify what I put into my body, I am encouraged to read food labels to recognise in more detail what is good or bad. And so food, dietary components, and labels become – I argue – another modes of governance.

Additionally, this subpage mobilises a 'healthy heart,' suggesting that it is inseparably linked to a 'healthy body', positioning it as a crucial outcome of a healthy diet, something that I should "look after." A 'healthy heart' emerges as a materialised element of a healthy life and a focal point of the online intervention.

The 'managing my weight' (fig. 4) section strengthens the connection between being overweight and heart disease, emphasising the link between a healthy weight and a healthy heart again. To remain healthy, I am again encouraged to stick to particular eating practices. Nevertheless, diet and



Eat well

Food and diet ▾ | Recipes and tips ▾ | Digestive health ▾

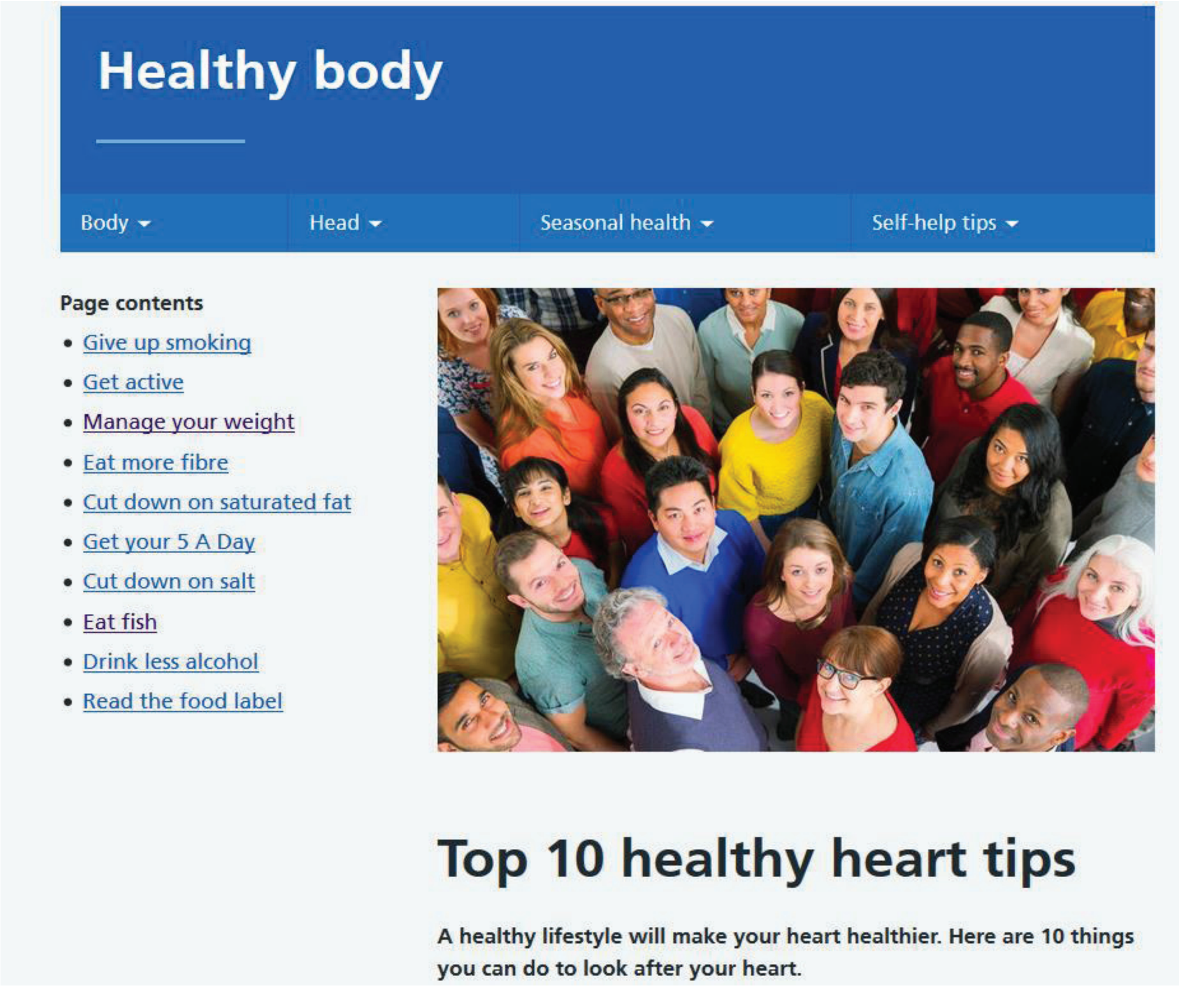
Page contents

- Food groups in your diet
- Fruit and vegetables: are you getting your 5 A Day?
- Starchy foods in your diet
- Milk and dairy foods: go for lower-fat varieties
- Beans, pulses, fish, eggs, meat and other proteins
- Oils and spreads
- Eat less saturated fat and sugar
- Need to lose weight?

Eating a balanced diet

Eating a healthy, balanced diet is an important part of maintaining good health, and can help you feel your best.

Figure 2.



Healthy body

Page contents

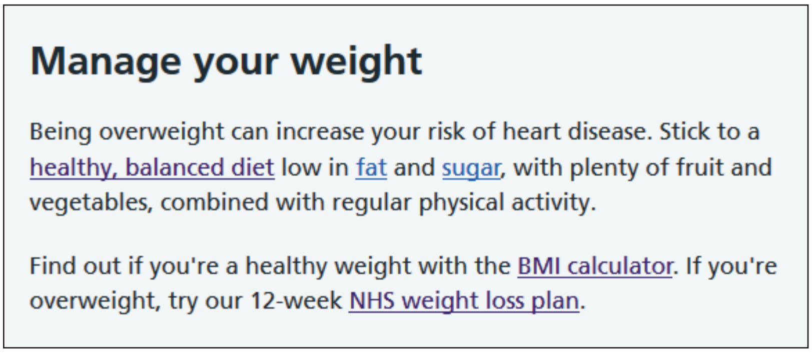
- Give up smoking
- Get active
- Manage your weight
- Eat more fibre
- Cut down on saturated fat
- Get your 5 A Day
- Cut down on salt
- Eat fish
- Drink less alcohol
- Read the food label

Top 10 healthy heart tips

A healthy lifestyle will make your heart healthier. Here are 10 things you can do to look after your heart.

Figure 3.

weight management should be accompanied by "regular physical activity". Regular means repetitive, ongoing, continuous actions that I should do with my body. Thus, I ought to monitor what and how many times I eat. Although, it might be not enough. It works best together with 'regularly' working out. I am told to check the BMI calculator to see if I am at a healthy weight range. And if I am not, I can use the twelve-week weight loss protocol. Managing my weight assembles efforts of balancing, regularity, diet, working out, the BMI and a 12-week plan. Incorporation of those practices into my life asserts sustaining a healthy body. However, governing the body through a balanced diet or exercising cannot guarantee an ontological certainty that my body will stay healthy and fit; it does not reduce the risks of becoming unhealthy again. It generates effects of an ontological tension epitomised and reinforced by a moral obligation to constantly evaluate what I do to and with my body. Thus becoming an 'ontonorm' – an imperative of how I should be in the world (Mol, 2013).

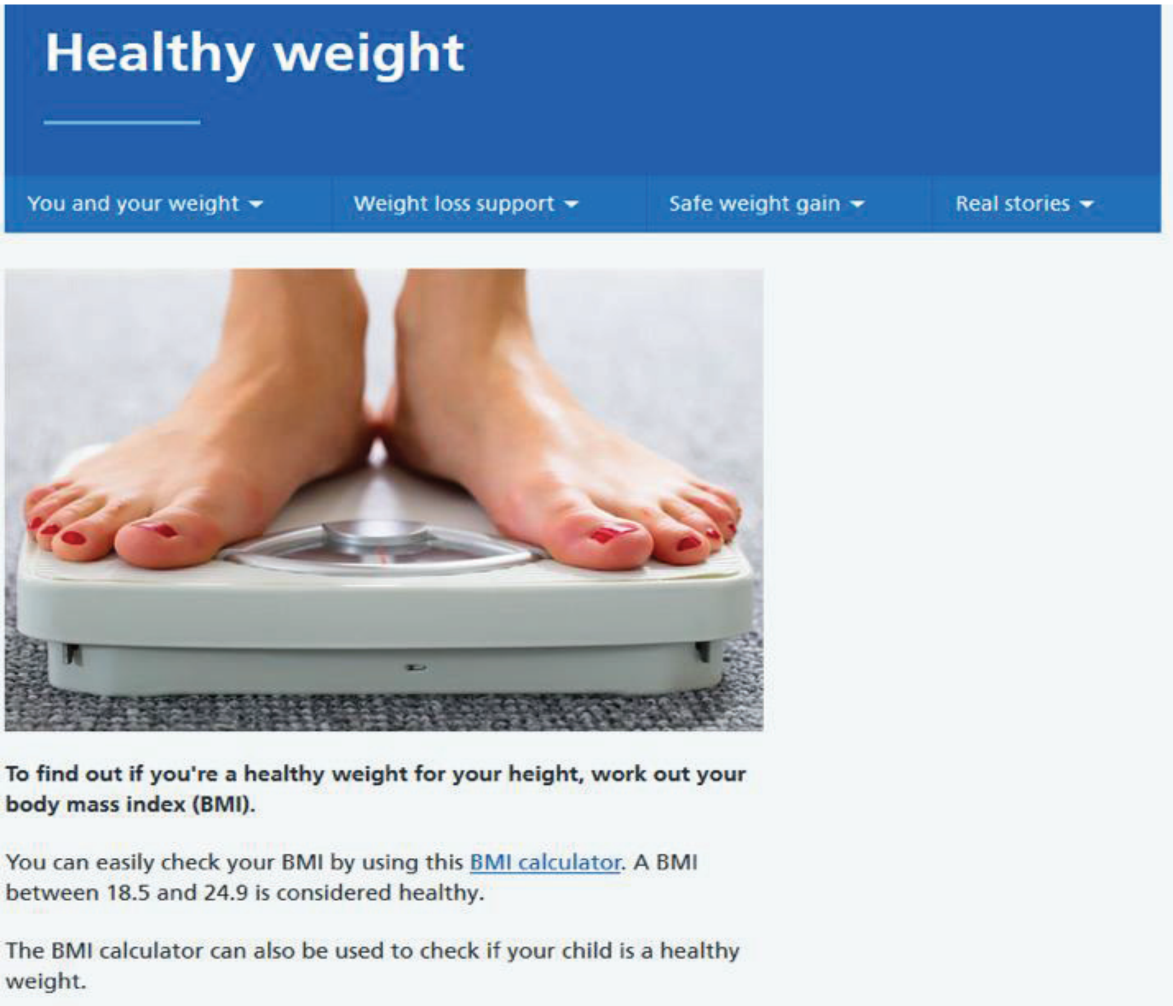


Manage your weight

Being overweight can increase your risk of heart disease. Stick to a healthy, balanced diet low in fat and sugar, with plenty of fruit and vegetables, combined with regular physical activity.

Find out if you're a healthy weight with the BMI calculator. If you're overweight, try our 12-week NHS weight loss plan.

Figure 4.



To find out if you're a healthy weight for your height, work out your body mass index (BMI).

You can easily check your BMI by using this BMI calculator. A BMI between 18.5 and 24.9 is considered healthy.

The BMI calculator can also be used to check if your child is a healthy weight.

Figure 5.

The narrative about "healthy weight" (fig. 5) is visually reinforced by the moment of weighing. Standing on a scale disrupt the remoteness of the online self-care accentuating the weight measurement here-and-now as a key component of health. That is why – it is asserted – I should monitor it through the usage of the BMI calculator. The healthy weight ratio ranges from 18.5 to 24.9 points. Thus, potential calculation opens up another concern: staying within the healthy range. Those numbers and the BMI metric reflect the question posed in a previous screenshot (fig. 4): Should I check my BMI and find out if I weigh too much? How much weight might I consider losing? Therefore, a seemingly innocent and simple edict – measuring my BMI – becomes a moral matter of concern further extrapolated into living with a healthy weight and having a good life.

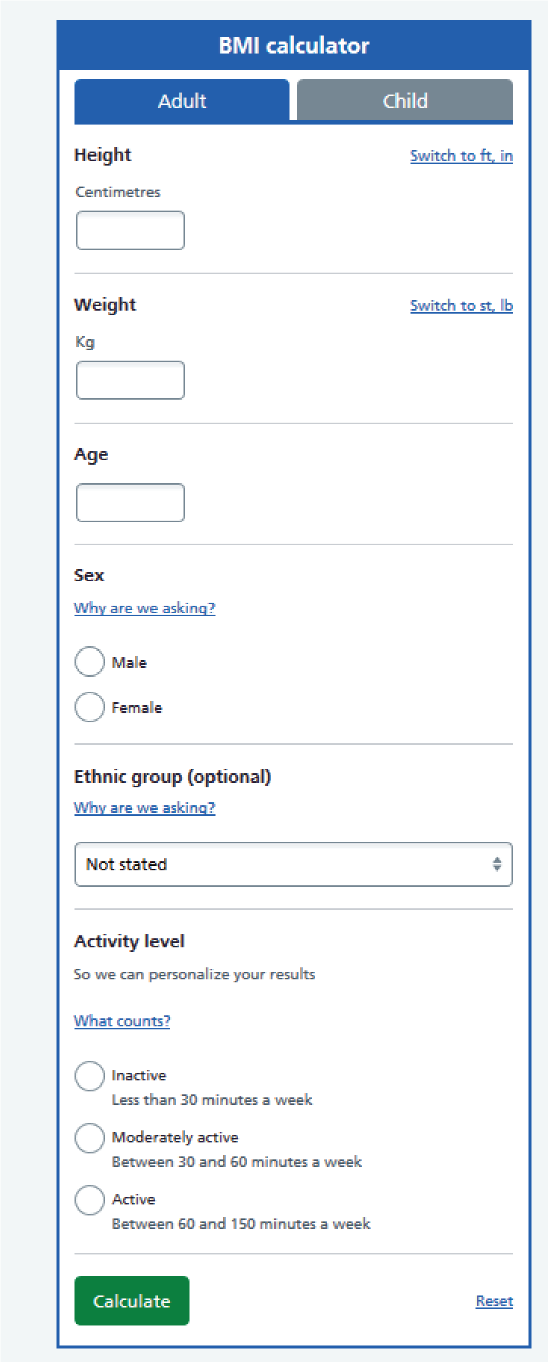
To sum up, engaging with the three subpages of the "Live Well" section makes up my body, weight, health, and wellbeing through a sequence of normative recommendations about eating practices, good and bad nutrients, and the BMI ratio and exercising. Hence, I am invited to check my BMI using the BMI calculator, and thus, to bring my numbers into play locally and here-and-now. These numbers are assumed to objectively represent my external, real body. My numbers, though – both weight and height – in reality, are messy and fluid. In fact, over the last six months, my weight fluctuated between 88 and 95 kilograms. To mitigate the messiness, I would need to use a scale. But the scale might be inaccurate or faulty. If I do not have a scale at hand, I would have to rely on my memory or imagine how much I weigh now. I do not have a scale in my home; hence I sometimes use the one at my local gym, which is always a stressful moment for someone with a body and weight distorted perception. Especially because, having a problematic relation with my body shape and weight, I desire to be of a certain weight. Thus, an act of measuring my weight has concrete effects: anxiety and stress before and happiness or disappointment after the weigh-in. Thus, typing my imagined weight into the calculator may be a projection of what I would like my 191cm tall body to look like. Therefore, "checking my BMI" means that I am invited to translate the reality of my messy, fluid, and contingent body mass through 'accurate' numbers into a seemingly objective, stable, and standardised tool to address and regulate the uncertainty about my health. I claim that tinkering with the numbers will trouble the regulatory objectivity (Moreira et al., 2009) of the BMI calculator, arguing that it is not a static, passive and stable tool representing my body, but it actively participates in momentarily re-doing different versions of my body. Consequently, the device activates respective assemblages of the NHS website invoking and amplifying the problematic relationship between me, my body shape and weight and my life.

Tinkering with numbers

Through staging an experiment with my numbers and eventually with the BMI device, I engage with an *evidence-making intervention* framework to disrupt the apparent precision of numbers and the BMI calculation. On the other hand, I will also trouble the online intervention's assumed remoteness showing how my engagement with the digital device situates the event in my local context and lived experience of weight and body perception issues.

After I have clicked into the suggested BMI tool tab (fig. 6), the short diagram with height, weight, age, sex, ethnic group and activity level pops up.

The original BMI calculator categorises me and my body based only on sex and age. However, the NHS version extends it by 'ethnic group' and 'activity level'. Activity level is broken down into three categories. Although, more importantly, my fitness trajectory is done by a certain numerical range that predefines three (inactive, moderately active, active) potential manners of my workout practices. Therefore, a concrete time frame predetermines my imagined fitness level ordering my body to fit in and enacting it through fixed numerical categories. However, tinkering with the BMI does not necessarily work that way; it potentiates affective qualities because my personal trajectories and my body mass are messy and contingent. More importantly, experimenting with my activity levels and calculating my BMI momentarily activates thinking about my entire sport history, my struggles with my body shape perception and the process of pursuing what



BMI calculator

Adult | Child

Height — Switch to ft, in

Centimetres

Weight — Switch to st, lb

Kg

Age

Sex

Why are we asking?

○ Male

○ Female

Ethnic group (optional)

Why are we asking?

Not stated

Activity level

So we can personalize your results

What counts?

○ Inactive
Less than 30 minutes a week

○ Moderately active
Between 30 and 60 minutes a week

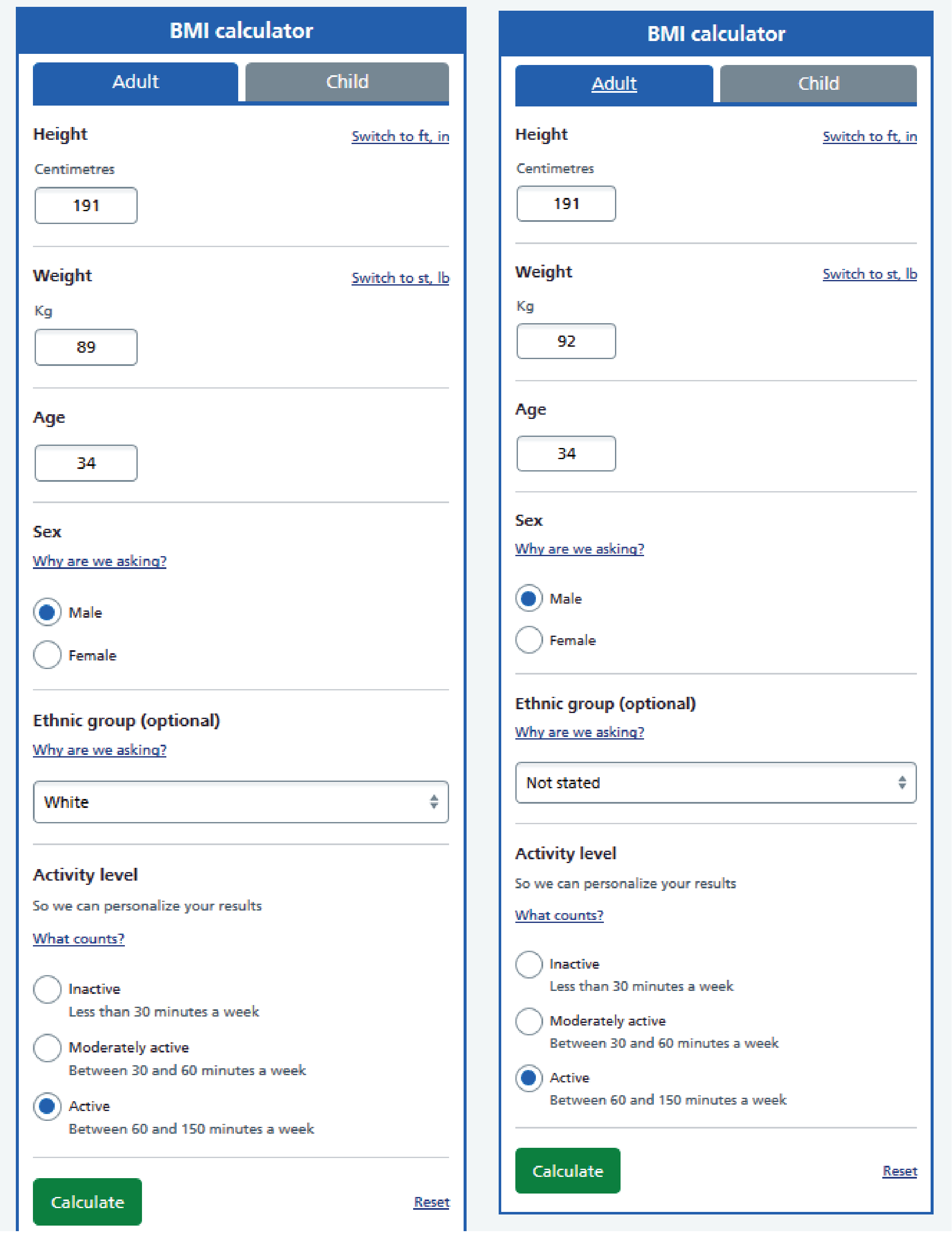
○ Active
Between 60 and 150 minutes a week

Calculate — Reset

Figure 6.

I am now. Playing with numbers invites me to type in any weight I want because – as I argued before – weight is messy, fluid and situated in the here-and-now. It differs in the morning, in the afternoon, before and after dinner, before and after a workout. Combinations are endless and dependent on either my imaginative weight or weight mediated through everyday technologies. The same goes for my height. Assuming how tall I am, I may relate to documents stating my height, I may recall its last measurement, or I can simply imagine it. In this article, I experiment with my weights to explore what the new spaces such an experiment can open up and what ontopolitical effects does the BMI intervention afford

Tinkering with my weight (being between 89 and 92 kilograms) involves me sitting in front of my office screen stressing out because I want



BMI calculator

Adult | Child

Height — Switch to ft, in
Centimetres: 191

Weight — Switch to st, lb
Kg: 89

Age: 34

Sex
Why are we asking?
● Male
○ Female

Ethnic group (optional)
Why are we asking?
White

Activity level
So we can personalize your results
What counts?
○ Inactive
Less than 30 minutes a week
○ Moderately active
Between 30 and 60 minutes a week
● Active
Between 60 and 150 minutes a week

Calculate — Reset

BMI calculator

Adult | Child

Height — Switch to ft, in
Centimetres: 191

Weight — Switch to st, lb
Kg: 92

Age: 34

Sex
Why are we asking?
● Male
○ Female

Ethnic group (optional)
Why are we asking?
Not stated

Activity level
So we can personalize your results
What counts?
○ Inactive
Less than 30 minutes a week
○ Moderately active
Between 30 and 60 minutes a week
● Active
Between 60 and 150 minutes a week

Calculate — Reset

Figure 7.

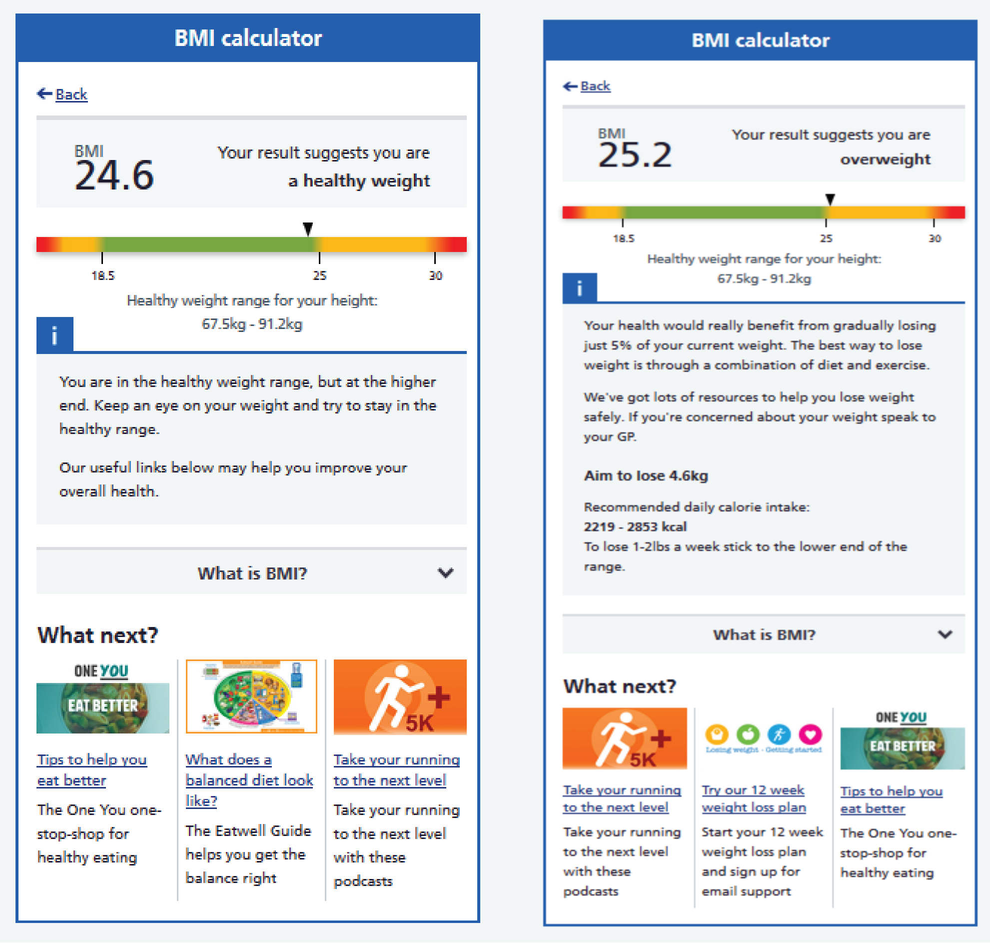
my BMI to reflect how fit and healthy, I imagine I am and if my martial arts, rowing and triathlon training for the last 20 years paid off. Therefore, the desire to be fit generates tension, excitement and anxiety about my result. I really want to be recognised and acknowledged as someone in exceptional shape.

The calculation generates two different subpages set apart by a BMI difference of 0.6 points; a seemingly insignificant difference, but one which enacts two different realities of a healthy weight and overweight. The initial weight of 89 kilograms (my usual post-workout weight) allows me to stay in the 'healthy weight' category. If I remake myself as weighing 92 kilograms – as I sometimes am – the numbers change, and the BMI changes. And so do the results and ontopolitical consequences.

Healthy weight reality

My first BMI result is 24.6 (fig. 8), which – according to the scale suggested by the NHS calculator – indicates that I came up at the "higher end" of healthy weight. For me, the maximum weight to remain 'healthy' would be 91.2kg. But it is not over yet. I receive advice and a recommendation to 'keep an eye' on my weight. Therefore, I cannot simply forget about my BMI and carry on. I must monitor it to stay in 'the healthy range' because my health is not stable, nor is my wellbeing. I argue that 'keeping an eye' on my weight transforms the dynamic of number governance. From a static, remote instruction to have a given body mass within a given range (67.5-91.2 kg), it is now made into a dynamic and continuous process of thinking about and maintaining my weight – creating a fluid, affective matter of concern adding to my already problematic weight and body perception. In other words, I am never *just* 89 kilograms. My body mass is never stable and static. On the contrary – every time I measure my BMI, I am becoming differently, and in order to be healthy and happy, I need to be constantly becoming differently but within a fixed numerical range.

"Keeping an eye on my weight" performs the matter of concern in several other domains as well. One is my own agency that is not to be fully trusted – I



Your result suggests you are a healthy weight

Healthy weight range for your height: 67.5kg - 91.2kg

You are in the healthy weight range, but at the higher end. Keep an eye on your weight and try to stay in the healthy range.

Our useful links below may help you improve your overall health.

What next?

Tips to help you eat better
The One You one-stop-shop for healthy eating

What does a balanced diet look like?
The Eatwell Guide helps you get the balance right

Take your running to the next level
Take your running to the next level with these podcasts

Your result suggests you are overweight

Healthy weight range for your height: 67.5kg - 91.2kg

Your health would really benefit from gradually losing just 5% of your current weight. The best way to lose weight is through a combination of diet and exercise.

We've got lots of resources to help you lose weight safely. If you're concerned about your weight speak to your GP.

Aim to lose 4.6kg

Recommended daily calorie intake:
2219 - 2853 kcal
To lose 1-2lbs a week stick to the lower end of the range.

What next?

Take your running to the next level
Take your running to the next level with these podcasts

Try our 12 week weight loss plan
Start your 12 week weight loss plan and sign up for email support

Tips to help you eat better
The One You one-stop-shop for healthy eating

Figure 8.

must "keep an eye" on myself because I am close to surpassing the healthy BMI number. The next concern also pertains to my weight, encouraging me to ask: do I have a single and stable weight? Should I step on the scale every time before putting my numbers in? Is my weight assumed to be changing to the point that the NHS edicts me to constantly monitor it? Answers to those questions are not, however, standardised, nor they are implicitly suggested. They are tied up with the process of me remaking myself through my daily weight and body related routines. They demonstrate how a seemingly simple intervention through the universal device is, in fact, locally situated and entangled in my bodily practices. Hence, performing a moral ordering of me and my life that is instigated by intra-acting with the website.

My BMI number – 24.6 – facilitates affective flows that the calculation entails. I may or may not act accordingly to the website edicts. I may or may not feel happy, sad, worried or depressed, but the online intervention is presumed to trigger an affective reaction that will result in improving my life.

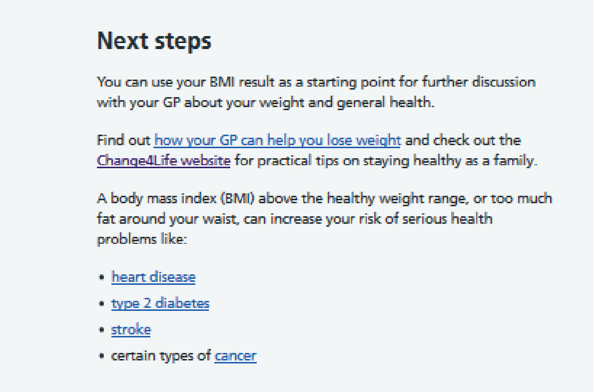
To address the above concerns, the NHS employs the future imaginaries (Brown and Michael, 2003) to explain the significance of my number by asking: "What next?". Three recommended options expressed as recipes propose the answer to the question. Two of them advocate the path of eating well and having a balanced diet. There is even a guide with a significant title: "Eat better" – a subpage that further fortifies the specific form of managing a good and healthy life. The tab presenting the reality of a "balanced diet" is construed as a representation of healthy living, with an annotation that "The Eatwell Guide" will assist in getting the balance right. The third suggestion provides a form of a protocol titled: "Take your running to the next level", aiming to improve my running capabilities, constituting the running (of all sports) as the primary activity that administers the maintenance of healthy weight and life. The promotion of running does not, however, account for my knee injuries, worn out joints or my marathons history making running a health risk in my case. Nevertheless, all three of those options govern me, my body and ultimately, my life in a particular way.

I claim that the NHS advocates for precise ontological and moral standards of specifically enacted healthy weight, body and life. It is is crucial for a good, healthy life preventing me from a whole spectrum of diseases. For me to reduce the risk related to being overweight, I am advised to follow proposed, normatively prescribed protocols. My body mass maintenance should be performed by the incorporation of detailed mechanics of action. Hence, in the following subpages, I can find eating advice, recipes for balanced meals and references to where and how help may be sought out. The "Next steps" (fig. 9) section discusses possible topics to raise with my GP and lists possible health risks if I become overweight.

Therefore, my weight mobilises new actors and triggers possible further interventions to govern my body and making my health and wellbeing, translated through my numbers, a matter of care.

Overweight realities

Not every intra-action with the tool produces new realities, but it may produce different *effects* (Rhodes and Lancaster, 2019a). Namely, when I tinker with my activity level and put "less than 30 minutes a week" instead of "between 60 to 150 minutes a week", my BMI stays the same – 24.6! Even though, apparently, my numbers do not change, what does it say about my weekly effort? Is it worth it at all if it does not affect the overall recommendation? Because I am still close to be overweight and thus at health risk. My activity level – in practice – does not matter. My BMI result, staying the same, does not actually incorporate and personalise my specific position as an



Next steps

You can use your BMI result as a starting point for further discussion with your GP about your weight and general health.

Find out how your GP can help you lose weight and check out the Change4Life website for practical tips on staying healthy as a family.

A body mass index (BMI) above the healthy weight range, or too much fat around your waist, can increase your risk of serious health problems like:

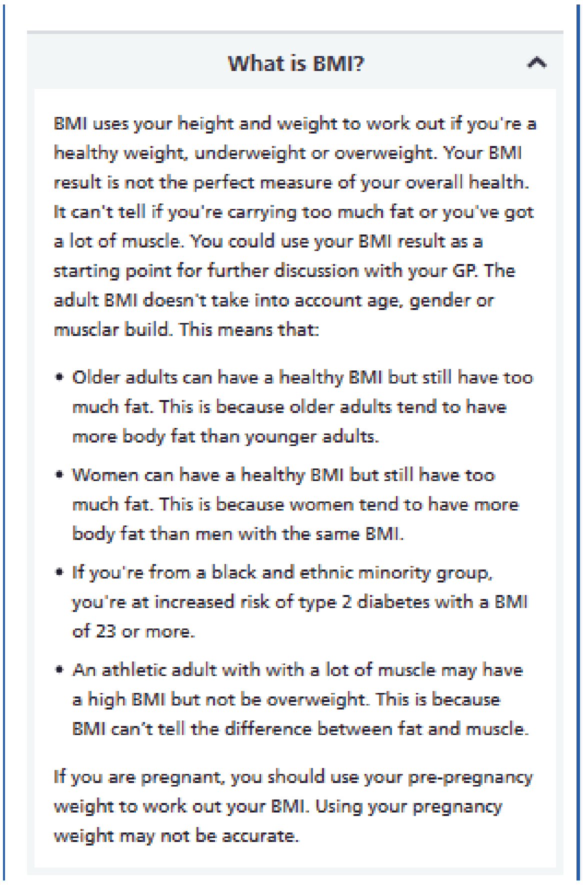
- heart disease
- type 2 diabetes
- stroke
- certain types of cancer

Figure 9.

extremely active person. The notion of a *within-limits contingency* (Rhodes and Lancaster, 2019b) captures this surprising outcome. It also unpacks the tension between the standardised and limited intervention of the BMI and a realist attempt to address contingencies. Ultimately, tinkering with my activity level does not enact *me* through the intervention but supports the premise of universalisation. Rhodes and Lancaster (2019b) claim that *within-limits contingency* reproduces the underlying ambition for universalisation and standardisation that the NHS website performs. In other words, the BMI calculations account for my personal fitness trajectory, but within the limits of an evidence-based approach, which does not produce new health recommendations but relies on predefined *me* and my presumed setting. The section called "What is BMI?" (fig. 10) outlining the restrictions of the calculator links a higher BMI with bigger muscularity, but it does not exhaust how relational and contingently 'open' the BMI calculator, in fact, is.

When I experiment with being 92 kilograms (fig. 8), I am reconfigured as 'overweight'. Hence, in a span of a couple of months, I crossed a threshold of a healthy weight, and I am told that losing five kilograms would be beneficial for my health. The estimated aim is set as 4.6 kilograms and a recommended daily calorie intake that sits between 2219 to 2853 kcal. Finally, there is an edict to cut my weight by 1-2 lbs per week, suggesting aiming at the lower end of calories consumption. Numerical calculations perform my 'overweight' reality in four ways. Firstly, my BMI is 25.2, which transfers me beyond the cutoff point. Because of that, I should become 87.4 kilograms, a number that I have not seen on a scale for years, and not 92 kilograms as before. Consequently, the above described two realities (being muscular and being overweight) are generated by a single BMI number mobilising strictly quantified eating practices, including a twelve-week plan and a correct calories intake. Additionally, it activates protocols of exercise represented by the 'running beyond the five kilometres' plan. Hence, my 92 kilogram body may be muscular and not overweight, or 4.6 kilograms too much and overweight. Both scenarios trigger different ontopolitical effects: becoming lighter to become healthy or one of being muscular – staying healthy. Therefore, my weight is not only simplified and reduced to precise numbers. It is translated through numbers and becomes entangled in the discussion about my general health, mental health, healthy eating, physical activity, and good life. Weight fluctuations, seemingly self-explanatory, appear to have moral consequences: one might become healthy or overweight in a short time. Following Gard and Wright (2005) I argue that the fluctuations are not innocent. In fact, combined with the NHS and the BMI assemblages, categorising weight shifting between borderline healthy, and overweight reinforces the discourse of the 'obesity epidemic' and 'weight anxiety'. Tinkering with this device unravels the stark consequences that using the BMI tool might have for people with problematic relationship with their weight and body**.** Ultimately, producing unwarranted concerns for the website's users.

Exploring the website further, I can find information about running programs or fitness routines. However, the goal of implementing these



What is BMI?

BMI uses your height and weight to work out if you're a healthy weight, underweight or overweight. Your BMI result is not the perfect measure of your overall health. It can't tell if you're carrying too much fat or you've got a lot of muscle. You could use your BMI result as a starting point for further discussion with your GP. The adult BMI doesn't take into account age, gender or musclar build. This means that:

- Older adults can have a healthy BMI but still have too much fat. This is because older adults tend to have more body fat than younger adults.
- Women can have a healthy BMI but still have too much fat. This is because women tend to have more body fat than men with the same BMI.
- If you're from a black and ethnic minority group, you're at increased risk of type 2 diabetes with a BMI of 23 or more.
- An athletic adult with with a lot of muscle may have a high BMI but not be overweight. This is because BMI can't tell the difference between fat and muscle.

If you are pregnant, you should use your pre-pregnancy weight to work out your BMI. Using your pregnancy weight may not be accurate.

Figure 10.

is to keep me not in a good physical condition per se, but rather to maintain a healthy weight within a concrete weight category. In other words – in a material enactment of standardised ontonorm.

Weight is never stable and fixed. Nor is the BMI calculator appearing instable and fluid as well. But it does things that go beyond mere tinkering: triggers my affective reaction and remakes me as overweight hence unfit, throwing away all the years of continuous commitment to be and stay in shape. Therefore, despite its remoteness, the BMI still does things in the real.

Furthermore, experimenting with my numbers unfolds the fluidity and liveliness of the online intervention and relationality of the calculator that, in fact, *makes* evidence along the way (Rhodes et al., 2019; Rhodes and Lancaster, 2019b).

In my final discussion, I will show how my intervening with the BMI device opens up the possibilities for caring differently about my healthy life situating it in my intra-actions with the calculator.

Discussion

By intra-acting with the NHS website, I demonstrated how evidence-based repertoires of the online intervention produce an array of collateral realities of my body governed by my BMI result. Bringing my own body as a subject/object of the situated experiment, I showed how the intervention through the BMI calculator is messy and contingent producing, rather than remotely reducing, ontological uncertainties about my weight, my health and my wellbeing. I argue, drawing on Puig del la Bellacasa's (2017) 'matters of care', that *situated* caring about the BMI could be then a form of care located in material-semiotic discourses, contexts and realities.

The discussed intra-action with an online location and intervention engages with a critical dialogue on the limitations of evidence-based forms of numbering governance. The case above demonstrated how multiple *ontopolitics* are simultaneously entrenched into a deceptively remote measurement practice. It has been shown how the result of such validation is entangled into ordering and governing my wellbeing through numbering and governing practices generating an environment where ontological uncertainty becomes normalised. Acknowledging the existing body of literature critically analysing the BMI, the conducted embodied experiment sheds a light on how online interventions and health care promotion could benefit from sensory sensitivity acknowledging relational contexts of the website's audience.

Furthermore, intra-acting with the website and the calculator inflicts this article with my own sensibilities, affections and my body (Myers, 2015) illustrating the entanglements of my body with the BMI. It is hence a methodological contribution to the new venues in sociology of health (Fox, 2016) of how to think with and work with Barad's approach. Although the concept of intra-action has been utilised in studies on quantification (Fox et al., 2018; Lupton, 2019) this article contributes to the broader debate on sociological experiments conceptualising research practice as a situated, embodied experiment and intervention in the making (Zuiderent-Jerak, 2015).

I posit my experiment then, as an instance of 'evidence-making intervention' and my tinkering with my numbers through the BMI device to make a deliberate ontological disturbance, as a means to interfere with the relative thresholds between 'within limits' and 'open' contingencies regarding the 'healthy weights'. This experiment has shown how numbering and measuring trigger affective encounters that transgress the virtual/real and remote/here-and-now dichotomies troubling the intervention of the BMI device. I argue that this particular evidence-based intervention accommodates rather than reduces concern-loaded effects of ordering me to constantly re-make myself as 'healthy'. Consequently, it may follow that the BMI calculator is more useful for a population level measurement rather than for a personal use.

Moreira (2012) acknowledges that in the context of investigating standards, Science and Technology Studies has done much to pinpoint how deeply politics has penetrated and informed standardised infrastructures. This article has expanded that work in showing how much the NHS website owes to evidence-based biomedical machineries by demonstrating how measuring and numbering are, in fact, moral orderings and governing practices. I also accentuated that evidence-based oriented repertoires enacted through an online location produce specific ontonorms that me and my body should follow to assure a healthy weight and life. I argue that those conventional ways of deploying standards and 'regulatory objectivity' (Moreira et al., 2009) are not the only option. Thinking with the framework of the EMI in the context of the NHS website, the BMI calculator and my body move the entire mechanics of the online intervention and self-care into a form of *ontological disruption*. Bodies become enacted more carefully. The taken-for-granted evidence-based resources and recommendations become supported through other forms of expertise and knowledges. Me, my body and any other body cannot be presumed as static but become fluid in how they are situated in specific material-semiotic contexts. Subsequently, it might allow for transforming the practices of numbering, where I become with my numbers, and not be done and governed by them. Governing might then lose its moralising attributes and potentially acknowledge my agency in enacting my body with the website. Therefore, Internet-based intervention could be then done differently because the evidence would be made not only by and within the website resources but by complex trajectories of my bodily experiences. As a form of an active, lively dialogue between me, my numbers, the calculator, and the NHS health recommendations. A dialogue where the health promoting information, underpinning decision making, bring together the website's normative edicts with end users situated and lived experiences. In other words, such a framework could inform policy makers with new forms of knowledge by giving a voice to policy addressees (Lancaster and Rhodes, 2020) through participatory intervention, more personalised features of the calculator or a nuanced feedback option.

Conclusion

Inspired by recent work in feminism technoscience that invites us to think with lively activism (Puig de la Bellacasa, 2011, 2017)2011, 2017, I provocatively ask: What if I will not let the BMI device render standardised intervention upon me? Caring would be then *situated* (Zuiderent-Jerak, 2015). It is not to say that health promotion campaigns and online interventions addressing health risks pertaining to obesity and eating disorders do not derive from a concern or care. It is to say that the mechanics and logics behind them are fused by realist epistemologies generating ontological concerns about weight and health reversing the desired results of the online intervention. I argue that online interventions through the BMI calculator are distressing especially in relation to a very problematic and complex relations people have with their bodies. Contrarily, a care-based intervention goes beyond the numbers governance and cannot be assessed remotely through an online calculator. Realising that the BMI calculator cannot be discarded in an instance, intra-acting with the BMI proposes disrupting the causal relation between the BMI result, people health and wellbeing. I consider, making the evidence through intra-acting with the website as a more careful, care-based approach. That is, a careful method would prevent the online interventions from producing damaging effects of underweight/overweight labelling and moralising edicts. Therefore, the NHS could promote care for the public differently. For instance, not promoting, through the BMI device, a controversial assumption that being 'overweight' is a health risk (Gard and Wright, 2005). Instead, the NHS website could better nuance the importance of the BMI calculator. For example, by fully recognising fit and muscular bodies in relation to the BMI ratio. And conversely, by acknowledging that healthy body and healthy life does not depend on the BMI measurement.

Care will not be then enacted by evidence-based politics, governing and numbering imposed on the body. Care would be framed as continuous responsiveness to the emerging embodied entanglements here-and-now (Barad, 2007). Thinking with evidence-making intervention would open up possibilities where body stays active in the entanglements launched by the website and the BMI. Caring for wellbeing and the good life will then be done by recognising and acknowledging situated complexities of bodies and life rather than being ordered by the device to become in a certain way.

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Surveillance, Discretion and Governance in Automated Welfare: the Case of the German ALLEGRO System

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Abstract

Several scholarly studies and journalistic investigations have found that automated decision-making in welfare systems burdens claimants by forecasting their behaviour, targeting them for sanctions and surveillance and punishing them without revealing the underlying mechanisms driving such decisions. This article develops an analytical framework combining three areas of concern regarding automation: how it might introduce surveillance and social sorting, how it can entail the loss of human discretion, and how it requires new systems of governance and due process. This framework steers investigations into whether and how automated decision-making welfare systems introduce new harms and burdens for claimants. A case study on automation processes in Germany's unemployment benefit service's IT system, ALLEGRO, applies this approach and finds that this system does allow for broad human discretion and avoids some forms of surveillance, such as risk-assessments from historic data, though it nevertheless increases surveillance of claimants through sharing data with external agencies. The developed framework also suggests that concerns raised in one area – whether loss of human discretion, surveillance, or lack of due process – can be mitigated by attending to the other two areas and urges researchers and policy-makers to attend to the mitigating or reinforcing factors of each concern.

Keywords: social sorting, digital welfare, due process, algorithms, data justice, social security

Introduction

"The real goal is what it has always been: to profile, police, and punish the poor." (Eubanks, 2018: 67) This is Virginia Eubank's take on automated decision-making systems used in the administration of the welfare sector in the US, convincingly described in several case studies. Eubanks' ground-breaking contribution to the study of algorithms and poverty gives insights into the ways IT systems can reproduce historically built discriminatory structures, targeted at controlling low-income populations. Since then, other academic studies and civil society investigations (Big Brother Watch, 2021; Alston, 2019; Dencik et al., 2018) have found that algorithmic systems burden welfare claimants by forecasting their behaviour, targeting them for sanctions and punishing them without revealing the underlying mechanisms driving such decisions. Writing about the UK context, for instance, Philip Alston (2018), as the UN's Rapporteur on extreme poverty and human rights, reports that the Department of Works and Pensions uses automation to make means tested calculations about benefits, putting the burden on claimants to contest any errors; UK social security data are also part of risk verification systems that add new dimensions to the surveillance of claimants. The aim of this article is to develop an analytical framework to understand potential or actual forms of discrimination and other harms against marginalised and under-resourced socioeconomic groups that may emerge in increasingly automated conditional welfare systems. Researchers (Bovens and Zouridis, 2002; Jones, 2000; Jorna and Wagenaar, 2007; Rodger, 2008; Wacquant, 2009) have long documented the harm wrought by welfare systems due to computerisation, changes in the conditionality of benefits and reorganisations of frontline services, all prior to the introduction of more recent algorithmic systems. This body of research suggests the analyst needs to address the multi-dimensionality of trajectories of change, including policy, information flows and everyday bureaucratic practices across a broader space than one that focuses solely on the algorithmic components of a system.

Drawing on approaches from surveillance studies, law, public policy and data justice, we develop a framework for analysis based on three aspect of welfare systems – surveillance, discretion and governance – that we believe will be useful to analysts, policy makers and implementers with responsibilities for the governance or adoption of automated decision-making systems. This article applies the framework to an exploratory case study focused on automation processes in Germany's lowest ranking welfare provision, the unemployment benefit ALG II (*Arbeitslosengeld II*), through the IT system ALLEGRO, created as part of the Hartz IV reform, which combined assistance programmes in 2005. State-backed welfare in Germany has followed the trend in most modern western states towards conditional models, where benefits are means tested (Schiller, 2016) and dependent on prescribed actions by claimants to take responsibility for their lives (Watts and Fitzpatrick, 2018). Conditionality may depend on demonstrating, with the appropriate administrative documents, levels of income, disability, responsibility for dependents, and details of everyday job seeking activities; it is equally likely to involve behavioural conditionality – sanctions for not complying with a treatment programme (Griggs and Evans, 2010). Established perspectives on welfare conditionality (Wacquant, 2009; Fletcher and Wright, 2017; Fletcher and Flint, 2018) highlight the disproportionate impact these systems have on the most disadvantaged, by imposing behavioural constraints on individuals even when there are no appropriate jobs available, forcing people into precarious and dependent work and treating individuals as deviants in need of reform and subject to a regime of surveillance and deterrence.

This move has gone hand-in-hand with increasing computerisation that shifts how public administration is managed (Mergel, 2021). For example, since the introduction of ALG II in 2005, the Federal Unemployment Agency (*Bundesagentur für Arbeit* or BA) in Germany has deployed IT systems to administer benefit distribution through partly automated processes of assessing a person's eligibility for benefits. Thus, this case study is an exploratory investigation asking if Germany's system deploys automation and data analysis in a similar manner as other countries' systems such as those Eubanks and Alston observed in the US and UK.

The framework we offer below focuses on three inter-related, but distinct concerns around discrimination and automated decision-making in government: 1) increasing surveillance of welfare recipients, as individuals are constituted and sanctioned though the information collected about them, and the social sorting possibilities of systems that compare and classify individuals against others, leading to new forms of predictive surveillance; 2) the removal of tacit knowledge and human discretion from these systems, which can create punishing hurdles of access and conditions that disregard individual circumstances and can disproportionately affect the most disadvantaged and, as a result of both these phenomena, 3) the ability for these systems to be deployed while avoiding or obfuscating democratic governance and due process. While these concerns are not exhaustive, they fuse two strands of existing research – on surveillance and social sorting on the one hand and human discretion in public administration on the other – to address the prominent issues raised about automated decision-making systems. We subsequently create a framework that can inform hypotheses or empirical accounts to locate if and when discrimination and other harms may occur as a result of automation, both at the levels of design and administrative implementation. We then describe our methodology and present the case study of ALLEGRO, analysed through the framework.

Before introducing these three concerns we provide an overview of types of formalised automated decision-making systems used to administer public social services worldwide.

Rule-based versus predictive systems

In a UN report, Alston (2018) distinguishes four main types of government welfare systems that use automated decision-making: 1) those making eligibility assessment, 2) those that calculate welfare benefits and payments, 3) fraud detection systems and 4) risk scoring and need classification systems. The first two types encompass *rule-based systems* that help determine entitlement of a service – for example, whether a person qualifies for welfare assistance – and, if entitlement is granted, the rate of the service. We draw on Le Sueur (2015) to define ruled-based automated decision-making as the process of turning decisions into 'if then' rules that select from predetermined alternatives: if the condition of the rule is met, then the consequence of the rule applies. The rules codify explicit and transparent policy choices on how people's circumstances are formally assessed and how benefits are calculated. These calculations are usually set by a public process, and certain classes of people are automatically eligible. For example, the UK Universal Credit system determines monthly payments drawing on a range of personal circumstances, such as housing circumstances and children, but is also based on automatic sharing of data on changing income between employers and tax authorities (Griffiths, 2021). Such calculations could theoretically be done manually by staff, but the automated system enables large scale payment processing to occur regularly without applicants having to submit new evidence manually every time income changes.

These rule-based systems do not cope in situations that involve risk assessment of vulnerability, employability, disability or fraud. Here welfare services may turn to *predictive* risk-profiling tools that help sort clients for different levels of response (Crisp et al., 2007). These indicators of risk may include factors identified by research or mandated by policy; combined, they form a model that returns a probabilistic score for an individual. Companies, professionals and sometimes academics develop these assessment tools in relation to a historic comparative population and past experiences of service provision, often using stakeholder consultation, trials, validity and usability testing and factor analysis. These tools are generally implemented via a checklist with simple scales completed by case-officers and applicants or through more laborious processes, as with a disability assessment. When a score reaches a certain threshold that is statistically related to factors or conditions identified in research and practice, this triggers further action. Examples include the VI-SPDAT scoring system, used to assess individual vulnerability to match people to housing in many parts of the US (Petry et al., 2021) and the more controversial BSP model used by the UK Work Capability Assessment (Shakespeare et al., 2017). The formalisation and standardisation of risk assessment tools has been a long-term policy ambition and requires considerable training to administer (Baginsky et al., 2021; Taylor, 2012; Crisp et al., 2007). While at times controversial, since the score can influence a person's interaction with public services, these tools are nonetheless transparent in how they categorise people and can be re-evaluated over time with real data on successes and failures.

Newer machine learning techniques used for predictive profiling are controversially less transparent in how they come to decisions. These techniques can be found in fraud detection systems that use a range of factors to determine that someone shares characteristics with people who have committed fraud in the past (Elyounes, 2021). An example is the Dutch System Risk Indication (SyRI), which pulled data on claimants from several government agencies for a risk analysis to determine anomalies that might signal fraud (SyRI was halted in 2019 by the Dutch Supreme Court for human rights violations against those it targeted) (van Bekkum and Borgesius, 2021).

The type of automation, along with the kind of data a system draws from and the model it uses, will raise different sets of questions about discriminatory or punitive effects, as we explore in depth in the three subsequent sections on surveillance and social sorting, human discretion and governance.

Automating Decision-making in Social Services – a Framework

Surveillance and Social Sorting

The arrival of increasingly complex regimes of conditionality and computerisation can first be analysed though the lens of surveillance as a mode of power in modern government (Gandy, 2021; Lyon, 1994, 2005). Data-focused surveillance infrastructures, first deployed heavily in the 1990s within security, policing and immigration (Rodger, 2008), have facilitated systems of mass targeted surveillance based on administrative data collection and linkage – the bringing together of information about individuals and populations across organisations. These digital systems also make it easier to socially sort people into categories then compare them to other people in the classification system, based on the idea that unwanted behaviour can be generalised across particular groups or neighbourhoods (Pykett, 2014).

Literature from human rights and data justice frameworks (O'Neil, 2017; Eubanks, 2018; Dencik et al., 2018; AlgorithmWatch and Bertelsmann Stiftung, 2019; Wacquant, 2009) has drawn on surveillance studies to critique modern state welfare systems as another extension of prison and disciplinary regimes, since claimants are required to provide increasing amounts of information in order to be awarded benefits or avoid sanctions – obligations that are burdensome and erode individual privacy. While collecting personal information can be beneficial – by improving efficiency and reliability and offering administrators an evidence base for decisions – it is only those in a situation of asking for assistance that must enter these regimes of acute targeted surveillance and high visibility not imposed on the rest of the population. Those requiring state support or intervention, in effect, open their lives to scrutiny from multiple government agencies and their databases. Fletcher and Wright (2017) describe, for example, how the UK Jobmatch website, which matches job openings to candidates' skills based on a digital CV, is "a surveillance tool garnering evidence for sanctioning," (Fletcher and Wright, 2017: 332) since Universal Credit benefits are conditional on using the site, and work coaches can check online activity for compliance.

The data collected about individuals can be used in rule-based automated systems to steer claimants towards certain predefined behaviours. Griffiths (2021: 6) argues that Universal Credit's means-testing algorithm enforces "'social and financial responsibilities' by obliging claimants to repay debts, fines and child maintenance based on fixed, generally stricter and less negotiable, repayment terms than under the legacy system". This behavioural modification, argues Griffiths, is a fundamental part of Universal Credit's design.

Beyond controlling behaviour, automation is used for social sorting and risk prediction in ways that are often hidden to claimants. There is a deal of mistrust among the press and public officials that risk profiling systems can embed biases at the level of data ingestion, leading to discriminatory results that target economic or ethnic minorities for surveillance and sanctioning (Metz and Satariano, 2020; Angwin et al., 2016; Alston, 2019; Stop LAPD Spying, 2018). In their report 'Poverty Panopticon', Big Brother Watch (2021) found that several child welfare systems in the UK include factors that could act as proxies for marginalised social and economic groups, such as data points in a child welfare system showing whether a child gets a free school meal, as certain ethnic groups disproportionately receive this benefit.

Finally, opportunities for surveillance are amplified when agencies share and link data. The Dutch fraud detection algorithm SyRI, for example, combined formerly separated datasets on welfare recipients to calculate their risk of committing welfare fraud (Henley and Booth, 2020). In the UK, local authorities under pressure to combat benefit fraud use risk verification systems that draw on data from multiple Council sources to categorise benefits applicants into different levels of risk to narrow fraud detection to the riskiest cases, putting the most vulnerable people under surveillance without their knowledge (Big Brother Watch, 2021). And in Eubanks' (2018) analysis of Los Angeles County's house matching system for the homeless, the Coordinated Entry System, she finds that the LAPD can ask for access to the intimate information it collects about Los Angeles' homeless population.

Automated decision-making in welfare systems puts the poorest populations under unique systems of surveillance for sanctioning and profiling to control behaviour. We will examine the due process implications of these systems shortly. In the next section, however, we look at a related, but different facet of automation that can lead to discriminatory effects: the reduction of human discretion.

Human Discretion

Computer systems and software that reduce or eliminate discretion by street level bureaucrats have been a topic of policy and government administration research since the 2000s (Jorna and Wagenaar, 2007; Bovens and Zouridis, 2002). Studies in this area have sought to understand the balance between the automatic application of decision rules and the cultural norms of a workplace that shape, interpret and curtail these rules. Jorna and Wagenaar (2007: 191) describe human discretion as "Administrative reasoning, finding out what is reasonable in a given situation, [and] the process of individualizing public law". As Widlack et al. (2020) point out, there can be good reasons to deviate from universal bureaucratic rules when other principles come into play, such as proportionality and fairness. Introducing automation, therefore, can weaken the discretion of bureaucrats to navigate between universal procedures and specific individuals' cases: where staff might give some leeway in response to an individual's circumstance, the automated system would not.

Key pressures to reduce human discretion by procedure or by automation in welfare include political rationales and post-crisis budgetary constraints calling for efficiency and error reduction, all responding to deep cuts to budgets and service elimination associated with austerity (Alston, 2019; Mohabbat Kar et al., 2018; Baginsky et al., 2021). Eubanks (2018) documents the US case of Indiana, which rolled out an automated welfare system in order to make its public workforce leaner; clients who had trouble enrolling for benefits could only call a hotline, not visit in-person case workers, and benefit enrolment numbers plummeted.

Automated systems can range from being *decision-aids* to *decision-arbiters* that enact laws and legal standards. Elyounes (2021) describes how decision-aiding systems that allow 'strong human discretion' (a term she derives from law to describe extra-legal standards judges may rely on beyond the rule of the law) offer a wider range of options to reach a conclusion that takes the particular circumstances of the case, such as a person's intent, into account. The Dutch SyRI system, for example, was a predictive system that did not automatically sanction someone found to commit fraud or instantly trigger an investigation. Instead, SyRI flagged individuals as likely to commit fraud for further inspection, a suggestion that street-level bureaucrats could take up or not, depending on their discretion of the particular case (Elyounes, 2021). Yet human discretion around automatic recommendations can vary widely. In their studies of automated government systems, Veale et al. (2018) found 'automation bias' – either under or over-reliance on the model's results – such as officers keen to follow the suggestions of a predictive policing model, or cases where staff were sceptical or even resentful of the results (their example is helicopter pilots whose routes are created by a machine-learning algorithm).

Beyond decision-aiding systems are systems acting as *decision-arbiters* – systems that make a decision and act on it at the same time. One example is Universal Credit's Real Time Information system, which determines benefit payments automatically with a data feed based on past employment reporting; if claimants submit proof, such as a payment slip, to refute the employer's account, they must wait weeks to receive the accurate amount (Alston, 2018). Another extreme example is the Michigan Unemployment Insurance Agency's system called MiDAS, which cut off benefits automatically to claimants suspected of fraud when they didn't supply documents proving the contrary. MiDAS would automatically send a letter to an individual asking if they intentionally submitted false information, leaving no space for open ended explanations. In the event that an individual didn't respond in ten days, or if individual's responses weren't sufficient, the system could automatically cut benefits, garnish wages and seize tax refunds. MiDAS replaced around 400 employees who had reviewed the claims with its launch in 2013 (MiDAS had a severely high error rate, as 92% of appeals against MiDAS were successful in court) (Elyounes, 2021). The problems with these preemptive calculations about benefits is less about surveillance and control than about how they depersonalise claimants and shift the burden to them to contest any errors (Alston, 2019).

Research at the intersection of data science, public policy and law makes a further distinction between the discretion given to street-level bureaucrats versus the discretion delegated to the engineers of automated systems (Elyounes, 2021; Shroff, 2017; Widlack et al., 2020). The latter is tied to how human discretion becomes operationalised, influencing the type of model used, the data it ingests, and the weighting of the factors of the algorithm. Such engineering decisions will shape not only the decision outputs but how frontline staff relate to them. For instance, Shroff (2017), who worked with Children's Services in New York City to predict repeat reports of abuse or neglect, describes how staff chose a model that prioritised predictive accuracy over explainability – their ability to understand the results. Shroff argues that tool developers should work with frontline bureaucrats during the design phase to elucidate how automation could support their work and determine what levels of discretion and explainability it should allow.

As argued, the surveillance and social sorting capacities of large scale informatised welfare systems subject certain sectors of society to mechanisms of punishment and control. Reduced human discretion introduces other problems: a rule and standards-based approach to the application of the law that can reduce attention to individual circumstances and intent and put the burden on recipients to challenge punitive decisions. Weaker human discretion can also create hurdles for agencies to comply with due process and accountability requirements under GDPR and other laws. Because due process and accountability are also fundamental to questions about the data collection and surveillance aspects of these systems, we treat this issue separately and more in-depth in the next section.

Governance

Both the surveillance aspects of these systems and their reduction or reshaping of human discretion raise questions about due process and accountability – how these systems can be queried regarding the personal information they store, the decisions they make, and their accuracy and legality. Several EU laws, such as the Code of Good Administrative Behaviour, article 41 of the EU Charter of Fundamental Rights ('the right to good administration'), and European Union's General Data Protection Regulation, which seeks the protection of natural persons with regard to the processing of personal data, support the right for citizens to receive justification for the decision-making steps leading to an administrative outcome (Widlack et al., 2020). However, scholars and civil society groups have pointed out that automated decision-making systems can make these steps opaque or obscure the origin of the underlying data upon which the decision was based (Grimmelikhuijsen and Meijer, 2014; Big Brother Watch, 2021).

Rule-based systems that significantly weaken discretion and enact laws and standards automatically raise issues of due process when those affected may have little time to appeal before the action results in negative consequences. With MiDAS the automatic sanctions resulted in bad credit reports and fines that led to bankruptcy for some, and in 2015 three claimants brought a lawsuit, ongoing at the time of writing, against the agency that deployed MiDAS to contest the lack of due process citizens had against its accusations of fraud that were false in most cases (Thompson, 2018).

Due process can also be complicated or slowed down when the decision-making agency draws on data that has been shared automatically by another agency that is the data holder. Widlak et al. (2020), for instance, describe the case of a Dutch family charged by a public agency, the Central Administration Office (CAO), for their personal contribution to three months of state-provided elder care they did not receive; the judge ruled that the agency was not at fault because it had simply acted upon information automatically received from another body, and so the CAO was not responsible for the accuracy of the information given to it by the other agency. Here, Widlak et al. (2020) argue that 'automated network decisions' – data shared automatically between agencies – make it possible for an administration to evade accountability of the decision.

Predictive systems raise further issues around due process. One concerns the ability of staff to understand and explain how a decision was made by the system if it uses machine learning techniques. In the SyRI court case, for instance, plaintiffs pointed out that public officials did not know why a person was flagged by the system (Elyounes, 2021). Another issue is that citizens often do not know they have been flagged by a risk model, much less their risk scores (Metz and Satariano, 2020). The Poverty Panopticon report (Big Brother Watch, 2021) found that many UK Councils using analytics for children's welfare and crime do not have robust policies in place to reveal how their probabilistic systems work or how they impact individuals.

Due process – a citizen's ability to query the system – is somewhat distinct from internal or external accountability processes that check the performance of these systems (Widlak et al., 2020). In addition to being able to provide information to a person about the basis of an automated decision, an agency should also conduct procedural audits over time to check on both the accuracy and also fairness of decisions, in compliance with national equality and anti-discrimination laws. Many internal audits, however, are often not easily available – Big Brother Watch (2021) submitted Freedom of Information Requests to gather examples of equality impact assessments across the UK; in several cases, agencies would not disclose audits or the algorithms used.

Transparency and due process can be further complicated if a system is designed by commercial vendors with the ability to hide operations under intellectual property claims and confidentiality clauses. In the UK, Councils in Hackney and Thurrock have worked with a company called Xantura to develop a predictive model for their children's services teams; council officials have refused to discuss the variables that go into the system, citing commercial sensitivity (though an investigation found that one variable is age, a protected characteristic under UK law) (Booth, 2021; Big Brother Watch, 2020). Responsibility for failures and bias also becomes an issue with these public-private partnerships; in the case of Michigan, the private vendors who designed MiDAS were named as defendants along with the Unemployment Insurance Agency, allowing all parties to point at each other to deny their own culpability (Egan and Roberts, 2021).

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This three-part rubric (surveillance, human discretion and governance) raises a set of questions that we can ask about the design of automated decision-making systems in social services: What is the type and function? Does the system conduct surveillance on users through data collection, data sharing or statistical profiling? Does the system reduce human discretion and to what degree? Does the system allow public oversight and due process to query its outcomes? In the next section, we introduce our methods and case study of a particular rules-based system, asking how this system interacts with the environment around it and how it may enact the various harms described so far.

Method

In order to apply our framework to the sociotechnical elements of an automated decision-making system, it is useful to look into its historic development, its institutional incorporation and the "reasons for subjecting the system to the logic of computation in the first place" (Kitchin, 2017: 25). This study uses primary source and media documents and explorative interviews carried out with administrative staff and benefit recipients to understand ALLEGRO. The analysis included reviewing 30 legal and administrative documents from the Federal German Labour Agency, the *Bundesagentur für Arbeit* or BA, and the implementing JobCenters, detailing the unemployment benefit program ALG II and the administrative software ALLEGRO and a dozen newspaper reports covering the system. We retrieved the documents from the homepage of the BA and from previous freedom of information requests; they consist of user manuals for the administration software, internal communications, legal texts and information provided for the public and were used to gain a deeper understanding of the phenomenon.

This information was complemented by six approximately one-hour exploratory interviews conducted over two months in 2019. We selected interviewees to give insights into different aspects of ALLEGRO: two employees of the department of automation processes in the BA, one business consultant, a JobCenter employee and two benefit recipients. The BA experts were administrative staff who had some knowledge of the technical part of the system, while the benefit recipients have experienced the workings of the system first hand. The interviews were conducted as semi-structured interviews, open to emerging issues but structured around the questions drawn from the framework about 1) type of system, 2) whether surveillance and behavioural control occurs through data collection, data sharing or statistical profiling, 3) whether the system reduces human discretion and to what degree and 4) whether the system allows public oversight and due process. The interviews with the BA experts were more formalised and targeted at understanding the technical layout of ALLEGRO, while the interviews with the benefit recipients and the JobCenter employee focussed on their experiences of interacting with the system and the application process in general, including interactions with front line staff.

While it would have been valuable to ask software developers in the BA to identify if they had any discretion or input over trade-offs and concerns at the level of technical design – data sharing, interface, etc – the BA did not agree to interviews with their developers. Hence, this article focuses on the software from the user perspective, specifically the data input and the interactions between different interfaces.

These insights are therefore based on limited research data. The people interviewed about the software were all employed by the administration; potentially, they cannot speak openly about discriminatory structures, or problems with operation of the systems, and we did not get approval after requesting interviews with software developers about choices in building the systems or policy makers managing specifications and delivery. To get an outside view, we talked to an external business consultant, who shed light on the development process of ALLEGRO, and to two benefit recipients about their experiences of applying for and receiving unemployment benefits. We analysed the data with the earlier described questions in mind, using thematic analysis to draw out emerging themes (Evans, 2017).

As the scope of the document analysis and the qualitative interviews is too limited to map the system conclusively, this article develops hypotheses for further research. In the following sections, we describe ALLEGRO and its predecessor and the political and administrative motivations behind them. We finish with hypotheses about how the system might discriminate against claimants.

Automation of Unemployment Benefit Distribution in Germany

Background of the Hartz IV Reform

The coalition of Social Democrats and the Green Party reformed Germany's labour and welfare sector in the early 2000s, reshaping the labour market and restructuring the social insurance sector (Bundeszentrale für Politische Bildung, 2007). Here we focus on Hartz IV, the reform of unemployment protection.

Germany's Hartz IV reform merged social assistance and unemployment assistance into one means-tested benefit system, which was officially called ALG II. ALG II is administered by the BA (*Bundesagentur für Arbeit*, the Federal Unemployment Agency) and implemented by the local JobCenters,[1] where unemployed people can apply for benefits and get help finding new employment (Butterwegge, 2018). As of 2020, ALG II recipients are entitled to a maximum of €432 per month; the JobCenter also pays for their rent and utilities (either sending payment to the claimant or directly to the landlord), health insurance and public broadcasting fee, and it provides reductions on local transport and cultural institutions (Bundesministerium für Arbeit und Soziales, 2019). Applying the law is very complex because case workers must assess the life circumstances of the benefit recipient in order to calculate the appropriate rate. Considerations include existing assets, additional needs and the 'community of dependence', which means that if the benefit recipient lives with a spouse, a child or parent of working age or in a relationship with a partner without being married, this community of dependence is responsible for providing an income, and the ALG II rate will be reduced accordingly. Another integral part of the Hartz reforms was a focus on activating job-seeking (Stiller, 2010: 71). One activation measure is the sanction; if a person fails to write the required number of job applications or misses appointments at the JobCenter, they can be punished, potentially losing up to 100% of their benefits (hartz4.org, 2019). These reform processes are some of the political and legal dimensions that help us understand why the BA developed the IT systems as they did – a process we look to next.

ALLEGRO

The conflation of the benefit systems in the early 2000s demanded a new software to administer the large amount of unemployed people eligible for ALG II. The first system the BA developed, called A2LL, was error-prone and expensive; the BA had outsourced its design to T-Systems, an affiliated firm of the Deutsche Telekom, Europe's largest telecommunications company. In 2014 the BA developed a completely new system called ALLEGRO – 'Unemployment Benefits II – Output Procedure Basic Security Online', which solved the previous issues, according to BA and JobCenter employees we spoke to. Learning from past experiences, the BA decided to keep the development process of the new system in-house and employ individual specialists from other companies on short-term contracts (Interview 140619, 2019; Interview 260619, 2019). Due to a high rate of personnel turnover, the IT development took two years longer than planned (Interview 260619, 2019). The system that rolled out in 2014 responded to legislative amendments, correctly calculated benefit levels according to the statutory rate, and greatly relieved the workload of the front-line JobCenter staff (Interview 020619, 2019).

ALLEGRO performs calculations and connects the operator to other external interfaces. When someone applies for unemployment benefits, the operator will first query ALLEGRO for any pre-existing information on the applicant. No data is stored within ALLEGRO, so the query is passed on to another system, STEP (*Stammdaten-Entwicklungs-Projekt*, Historical and Core Data Development Project), the central database that stores information about anyone applying for or receiving unemployment benefits. Since 2016, the BA stopped using paper files, so all information and documents belonging to a case are now stored digitally on a server in an 'E-File' (*E-Akte*) (Interview 140619, 2019).

At this data entry point, the complexity of ALG II comes into play. Two principles are important: the subordination principle and the community of dependence inspection. ALG II is subordinate to all other income, assets or other benefits. If someone receives a pension, for example, the pension will be deduced from the ALG II rate. If someone has savings in the bank, they will not receive ALG II until those savings are used up. These two examples are straight-forward calculations; things become more difficult when the operator or the applicant is asked to input more subjective numbers, such as evaluating the value of a property. If the house or flat is 'appropriate', that is, the person is inhabiting it themselves and it is not an estate that surpasses the value of an average living space, the property is not counted as an asset. But should a dwelling be evaluated as too large or expensive, the owner must sell the house or flat and make a living off the profit before they receive ALG II. Additionally, the operator will inspect if the claimant lives in a community of dependence from which they receive support. If a person does, it is the responsibility of the claimant to prove the nature of the relationship, and a certain amount will be deduced from the ALG II rate (Interview 140619, 2019; Interview 260619, 2019).

Entering the appropriate data into the system therefore leaves room for administrative discretion, which – at this point in time – is not automated. After the data is entered, ALLEGRO automatically calculates the eligibility of the claimant and issues an assessment verified by the operator and sometimes by a second member of staff. The BA head of department clarifies that "there is no end-to-end automation. In the beginning of the process is the input of data; in the middle the automation is well advanced; in the end is the manual completion of the process. For now." (Interview 140619, 2019) ALLEGRO saves the assessment in the E-File and transfers it to INVARIS, a document composition software that compiles the up-to 50-page long report, which is automatically sent to the claimant. ALLEGRO then instructs another system for money transactions, ERP, to commence payment to the recipient (Bundesagentur für Arbeit, 2014).

ALLEGRO has other functions beyond benefit calculation. For instance, when a client receives ALG II, the JobCenter will cover some of their medical and retirement insurance. To facilitate coverage, ALLEGRO provides data to two interfaces, COLIBRI and BabR, which connect ALLEGRO with systems held by insurance companies to register the clients for these benefits. The JobCenter staff are also tasked with helping unemployed people find a job as part of their activation role. In order to target employment options, the JobCenter operators access the claimant's data via a program called VerBIS that connects to ALLEGRO and transfers the job seeker's data to the operator. Through this interface, JobCenter employees can access some, but not all, of the data, much of it in a read-only mode, to see what a person's benefit status is and if they are on sanctions.

Finally, ALG II automates data sharing with the retirement insurance fund to detect fraud, though it limits the amount of personal data shared. Every three months, both the BA and the retirement insurance fund send personal and benefit data to a third system called DALG II, which compares the datasets to identify if a person is receiving benefits from both. ALLEGRO data is first transferred through an external system, DALEI, so that no external institution has direct access to ALLEGRO or the STEP database, where the personal data is stored. (SGB II, 2014; JobCenter Berlin Spandau, 2013). Upon receiving results, a BA employee will check each case in which someone receives two kinds of benefits to ascertain if further fraud investigations need to be carried out. Even people who do not receive ALG II but solely retirement money are checked in the system, as they may belong to a community of dependence with an ALG II recipient, who in turn, may get a lower ALG II rate (Interview 140619, 2019; SGB II, 2014).

Discussion

In the next section, we apply the framework presented earlier using available data, then form hypotheses in the discussion about where ALLEGRO may introduce harm.

First, what type of automated system is ALLEGRO? ALLEGRO is both an eligibility assessment and welfare benefit calculation system, as part of a network of systems that also engage in automated fraud detection, link to immigration control and feed into job seeking support; the data it ingests relates to individual's current financial assets and income and to their community of dependents. ALLEGRO does not include codified predictive elements based on historic data; it processes each applicant according to a rule-based system. Claimants are not subject to some of the potential structural biases found in risk probability algorithms, but may be subject to the discretionary decisions of the case workers made as they attempt to calculate financial support and cajole and pressure their clients into work.

We can also ask what role ALLEGRO plays in imposing surveillance and behavioural modification through automated sanctioning or predictive assessments. When a person applies for benefits, they must submit sensitive information about their assets and life circumstances. A person's relationships, housing circumstances or state of assets all become rateable by JobCenter employees. While JobCenter staff may use this information to generate work requirements and monitor any changes in circumstances, the data collected does not lead to automated sanctioning or loss of benefits and, as mentioned, it is not used for predictive risk assessments. Nor is the system made opaque through black boxing the data inputs or by using outsourced proprietary systems.

ALLEGRO *does* engage in personal data sharing in three ways. First, ALG II has a data sharing agreement with the retirement insurance fund to identify fraud automatically through DALG II. The data sharing, which limits the transfer of personal details, is set up to flag any data matching with the retirement insurance fund, which an administrator then investigates; this system does not score each claimant for levels of risk on other factors. Second, the BA cooperates with Customs to locate persons and detect casual work. When Customs suspect a person of informal labour, they call a BA service centre to query ALLEGRO for the persons' benefit status (Interview 140619, 2019). If the person is a recipient, the JobCenter will start making short-notice phone calls for an interview; this effectively interrupts the person's other work commitments during the day. The business consultant interviewee said this tactic was useful because people voluntarily quit ALG II after two or three such calls (Interview 260619, 2019).

Lastly, the police and the BA also collate data to ascertain foreigners' identities, since both have access to the Central Register of Foreign Nationals. JobCenter employees access this outside database to identify a person when they first apply for benefits (Deutscher Bundestag, 2019). The BA head of department stated that, due to a high influx of refugees in 2015, the cooperation with the police "was provided with an improved technological base" due to these systems (Interview 140919, 2019).[2] The BA interviewee was also pleased with the reduced level of illicit work and incorrect benefit receipt due to these data collations (Interview 140619, 2019). So, we find that ALLEGRO does share personal information with Customs and police in ways that could make claimants more visible to law enforcement, though this process doesn't happen automatically.

As with most welfare systems, ALLEGRO's approach to behavioural conditionality does not currently depend on automation. JobCenter employees decide themselves whether or not to compel recipients to certain measures, such as writing a fixed number of job applications per month or attending workshops and trainings and keeping appointments; failure to comply can result in benefits being cut up to 100%. The JobCenters also have informal ways of exerting power over benefit recipients. Both BA employees and ALG II recipients told us that the JobCenters do not actively inform applicants about their legal entitlements and that it is difficult to find out which steps need to be taken to get benefits. The recipients interviewed described that documents needed went missing, that they were pressured by JobCenter staff not to apply for support they were entitled to and that they were asked to pass on sensitive health data to prove a condition.

Does ALLEGRO reduce human discretion? According to interviewees, the system is a decision-aiding, not a decision-making tool that allows strong human discretion; it was not designed to move staff out of the JobCenters to replace them with an IT system, and the software does not make overriding decisions about whether to give or cut a person's benefits. The input and output to the systems both were, and still are, supervised by a human, and hence, benefit recipients can still discuss their case with a human.

The safeguards provided by law in Germany play a part in why the process can currently not be fully automated. ALLEGRO is based on the principle of 'individual case justice' (*Einzelfallgerechtigkeit*), which means that the life circumstances of every benefit recipient must be ascertained to identify if they are eligible to special benefits on top of the fixed rate. JobCenter employees must ascertain and document many complex details about a person's life, such as checking assets owned and wage statements. As the assessments of benefit recipients are always carried out by humans, case-by-case discrimination against recipients can still be traced back to a person, and administrators are allowed strong discretion to take individual circumstances into account. Greater automation, however, may still be on the horizon. In 2019, the BA introduced JobCenterDIGITAL that allows benefit recipients to file to continue ALG II; this application needs to be filled in every six to 12 months. If the recipient's circumstances are exactly the same as before, it is possible to process their claim in a mostly automated way because no discretionary decisions need to be made. The BA is lobbying for this requirement to make full automation possible.

From a due process perspective, how transparent is ALLEGRO to claimants? ALLEGRO is straightforward with its calculations, because recipients are in full possession of the information decisions are taken on, and the policies around standard requirements and entitlements are a matter of public legal record. Any disputes a person wants to make can be done in person at the JobCenter. Further, ALLEGRO was designed in-house, not through a private contractor, a situation that allows the BA control over its design and development. However, claimants may not be aware that ALLEGRO has flagged them for fraud nor understand how ALLEGRO shares their data with other systems and agencies, and it is not clear if frontline staff are able to challenge the results of data sharing from other agencies if they suspect errors.

In sum, and going back to our three original concerns, we find that, looking from the lens of *human discretion*, this system does not impose harm in the form of undue burdens through automation, as humans are given strong discretion to apply subjective and tacit knowledge at each point in the automated process. The implementation of ALLEGRO does not adhere to the same narrative of austerity and job cuts found in the UK and US contexts, although a repeated mention of relieving the staff and releasing capacities for more complex tasks could be the cloaked intention of reducing staff, even though this was squarely denied upon questioning.

Attending to the concerns from *surveillance* studies, our study shows that the system does not use automated means for behavioural control – humans appear to do this work based on outcomes from ALLEGRO – and it does not draw on historic data that could embed biases. However, the system does create new data flows that could make claimants visible to law enforcement and customs. This, of course, is deliberately done to prevent misuse of benefits and illegal working: the BA and the police increased data sharing cooperation due to the influx of refugees in 2015, and it would be useful to investigate further the kinds of data sharing that occur about people who do not hold German citizenship. The system opens the potential for greater visibility through data exchanges with authorities, and possibly the ability to coerce this sector of society. Note, however, that this data sharing is not automatic, but an effect of the automated system, which requires such data to be digitised.[3]

Finally, from a *governance* perspective, the JobCenters allow due process in the event that a person wants to query or dispute the welfare calculation. The data sharing with law enforcement and customs, in contrast, does not seem to allow due process, as individuals may not know when their data is exchanged with authorities. The distribution of welfare benefits in Germany is under great public scrutiny, so the German agency followed due public procedures when developing the decision-making processes of the new system. By contrast, the flows of welfare and migration data attract less public interest and could prove valuable as a further field of research.

Conclusion

Our main question is how to identify potential or actual harms introduced by automation in welfare and why these might emerge, attending to the interlocking of technology, policy and practice. To answer this question, we derived an analytic framework that is novel for bringing together three related but distinct sets of concerns: those found in surveillance studies and studies on human discretion in public administration, along with those based on a burgeoning set of literature on algorithmic governance. Each of these areas leads to distinct questions about automated systems that can help pinpoint different types of harm to claimants, from data-driven discrimination and behavioural control to absence of due process and depersonalised services that make no appeal to individual circumstance. This framework also suggests that concerns raised in one of area could be mitigated by attending to the other two areas – for instance, potential harms wrought by surveillance could be addressed by attention to the other dimensions: greater human discretion and better governance through due process and public oversight. Rather than stopping the analysis after identifying problems based on one set of concerns, this study urges researchers and policymakers to attend to the mitigating or reinforcing factors of the other two.

We demonstrate the utility of this analytic through a particular case found in the German welfare system. An advantage of this framework is that it can be applied to other types of systems in other contexts, and it allows comparison between systems, prompting reflection on the differences between them. We invite readers to build on this framework beyond what we offer here – for instance, we do not discuss the distinctions between the various harms examined, which range from the legal to the psychological. These distinctions among harms are also worth probing in greater depth, as they could yield different technical, policy-based and political responses to address them once identified.

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Notes

1 It should be noted that one third of the municipalities decided not to use software provided by the BA in their JobCenters. Hence, the results of this research apply only to two thirds of German municipalities.

2 Unfortunately, this was not elaborated by the interviewee and no further information could be found in official documents.

3 Note that the law, based on which payments are calculated according to individual circumstances, requires this kind of granular data collection. The law is the effect of a range of court cases in which the benefit recipients successfully contended to be assessed in respect to their individual cases instead of being provided with fixed rate benefits. While this reduced the level of automation, it increased the amount of data collected and held on individuals.

Relationality, Individuality and Entanglements of Helping in the Context of a Touristic Vaccine Trial:
Nordic Research Subjects in West Africa

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Abstract

This article explores the idea of relationality and distributive agency in the context of a clinical vaccine trial. The diarrhoea vaccine trial was conducted in Finnish adults, who travelled to West Africa[1]. Engaging with previous research on clinical trials in the global South that has emphasized the relationality and social embeddedness of Southern trial subjects, this article argues for an enacted social-material relationality of *any* research subject. As the vaccine trial under study transformed into practices and ideas of *helping*, the analysis illustrates forms of relational subjectivity and distributive agency by focusing on the notion of helping. The analysis is based on the trial participants' accounts and practices, and draws on qualitative interviews (51) and ethnographic observation conducted between 2017 and 2019 at the trial site in West Africa.

Keywords: vaccine trial, relationality, subjectivity, distributive agency, helping

Introduction

Relationality and the social embeddedness of research subjects is a key question in social scientific research on clinical trials in the global South (e.g., Sariola and Simpson, 2019). It has been suggested that the importance, even primacy, of social and material relations studied in different Southern trial contexts reveals and questions the West-centeredness of ethical guidelines in clinical research, and problematizes their assumptions of the autonomous individual. These guidelines[2] were developed in Europe, mainly since WWII, and it has been suggested that they carry powerful and universalizing assumptions about the autonomous human subject and its capability for consent, resulting in calls for more relational, everyday, and grounded ethics to complement formal ethical guidelines (e.g., Geissler et al., 2008; Molyneux and Geissler, 2008; Tengbeh et al., 2018; Fairhead et al., 2006). As vital as these critiques are, however, here I suggest that by attributing relationality only to 'Southern subjects' they might ultimately enforce racialized ideas of subjectivity. By analysing a Nordic vaccine trial recruiting Finnish trial participants traveling to West Africa, this article engages with previous research on clinical trials, and draws from feminist rethinking of notions of the autonomous individual and relationality. Further, I explore the ideas and practices of helping that emerged in the trial context to grasp some of the relationalities of the Finnish trial participants.

P. W. Geissler et al. (2008) and Salla Sariola and Bob Simpson (2011; 2019), among others, have shown that the realities of trial contexts in the global South – such as in the Gambia or Sri Lanka – aptly manifest the fundamental social embeddedness of an individual, should individuality be considered a meaningful point of reference in the first place. Studies in such contexts reveal the decontextualized underpinnings of formal ethical guidelines and regulations directing the conduct of medical trials. Ethnographic studies of clinical trials in the South challenge the assumed autonomy of research subjects and underscore their enmeshment in their social and material surroundings (Sariola and Simpson 2019; Enria et al., 2016; Enria and Lees, 2018; Fairhead et al., 2006; Kingori, 2015). It is suggested that these guidelines become problematic, or at least challenging to implement, in contexts where the idea of the human is inherently more relational – that is, defined by social and material relationships – or where freedom of choice (to participate) is considerably limited by external conditions (e.g., Sariola and Simpson, 2019; Wahlberg et al., 2013; Kingori, 2015; Geissler, 2008).

Such critical analyses are urgent calls for rethinking (bio)ethics and their cultural underpinnings, but also, I suggest, they speak to the legacy of work, especially in feminist theory, on the concept of subjectivity itself (e.g., Butler, 1990; Haraway, 1991; Barad, 2007; Jackson, 2013); yet the focus of such studies on the South – or non-West – is puzzling in a two-fold way. Although the act of problematizing universalizing notions through contextualized accounts is crucially important (Biehl et al., 2007), I argue that a tendency to simultaneously reproduce and to stabilize a difference between an assumed South and West still prevails. Relatedly, and more importantly for this article, I suggest that a focus on the problematic idea of an autonomous individual in Southern contexts tends to assume, even if implicitly, that such an idea of the subject may be useful and accurate in Western/European contexts. In other words, the critique of the autonomous subject in the field of clinical trial anthropology, when applied specifically to the South, might re-invoke the idea of an autonomous, modern Man, thus hampering (feminist) arguments for the relationality and social embeddedness of *any* subject (e.g., Jackson, 2013; Wynter, 2003; Oinas, 2017: 200-201).

Subjectivity and agency as relational have been theorized in Western social science for decades – as such, it is not new to claim the relationality of Westerners, too. However, gestures implying the idea of an individual, autonomous and rational subject as apt endure, and here, I consider anthropological studies on clinical trials especially in the South as possibly making such a gesture. Discussions on individualization, subjectivity, relationality and materiality also easily remain highly theoretical and abstract, and are not necessarily substantiated with empirical research (e.g., Meskus, 2015). When human relationality and materiality are empirically studied, the focus is easily on situations of emphasized neediness, such as illness, life crises, or childhood (in the Finnish context, see Honkasalo, 2008; Ketokivi and Meskus, 2015; Paju, 2013). Although I situate this study to this strand of research and theorizing, the case of Finnish volunteer trial participants in Western Africa allows to analyse social, material and discursive relationalities even when intentions, motivations and choice surface. Here, I draw from the STS tradition to highlight the importance of the situatedness and contextuality of all phenomena, and ask, with my empirical material: *how* does relationality come to the fore in a vaccine study on Western trial participants in the ethnographic data when spending time with the people travelling to West Africa as vaccine testing tourists? The aim is to detect the subtle ways relationality is done in a specific context of science, and 'helping', in the making.

Instead of focusing only on the scientific practices of the trial, I turn my gaze onto the ideas and practices of *helping* that emerged in this context. As I show, the presence of trial participants and practices interestingly transformed into a flow between the participants and local communities of objects, ideas, and desires connected with helping. Hence, I study relationality through contextualized *practices* and *ideas* of helping on the part of the vaccine trial participants, while also aiming to understand *helping*, in this context, from the perspectives of relationality and autonomous subjectivity. Therefore, I do not operate with a pre-set definition of helping; I take inspiration from anthropological research on humanitarianism that focuses on the 'helpers' (e.g., Redfield and Bornstein, 2011; Malkki, 2015; Benton, 2016; Jefferess, 2015) but, primarily, the research participants' views guide me in what can be considered helping in this context. The perspective clearly is one-sided, and the aim here is not to estimate, whether the practices and ideas here named as helping actually were of help to anyone, or to take for granted that such gestures of help were needed.

In my analysis of helping and relational subjects, I draw from theorizations of non-human or more-than-human agency, whose one key aim is to deconstruct the anthropocentrism in social sciences. Such thinking has been intense in theorizations labelled under new materialisms, for example, and in the field of indigenous thinking and Indigenous studies – although, despite similarities, dialogue between these two strands has been largely lacking (Rosiek et al., 2020; Martin, 2017). Here, certain general ideas shared by much new materialist as well as indigenous theorizing of non-human agency and relationality guide the analysis. First, relationality is a starting point and precedes the existence all of entities, human or not; second, relationality is processual – as are the entities generated within different, changing relations – it is about constant enacting and re-enacting; third, concrete and particular relations, environments, and agencies are of interest, instead of a general and abstract theory of non-human agency or relationality (e.g., Martin, 2017; Truman, 2019; Bennett, 2010; see also van der Zaag, 2017). The latter view may be better incorporated in indigenous theories, though it is, at least potentially, also present in some new materialist thinking (Martin, 2016). More specifically, I make particular use of Jane Bennet's (2012; 2010; 2004) notions of 'distributive agency' and 'thing power'. Distributive agency, simply, refers to the idea that agency is not a human capacity or possession, but rather, that "the agency of a self appears not only as radically entangled with nonhuman things, but as partially composed of such stuff" (Bennett, 2012: 258). The human subject appears in and through its relations with all kinds of other things, material and immaterial, human and non-human. Also useful here, Bennett makes a separation between material objects and things, suggesting that *things* are not taken over by the subject-object relation and hence not reducible or defined by the knowing subject. Thing power derives precisely from here; it is the vibrancy and forcefulness of the material stuff (Bennett, 2004; 2012) that may or may not affect human subjects too. While I draw from these 'more-than-human' strands of thinking, I simultaneously acknowledge the discursive and individuating forces at work in the construction of subjects, relational or not, and hence find post-structural theorizations of agency and the subject fruitful, too (Butler, 1990; Hojgaard and Sondergaard, 2011).

Problematically, questions of race, racialization and colonial power relations have been ignored in a great deal of theorization within new materialisms (Ahmed, 2008; Jackson, 2013). To address these processes in the context of my study, I take my cue from critical theories on whiteness that emphasize the invisibility and normalization of whiteness (Ahmed, 2007); I consider the notions of Nordic whiteness and Finnish exceptionality especially useful here (Loftsdottir and Jensen, 2012; Rastas, 2012). In the following section, I introduce the vaccine trial under review, before discussing related research on clinical trial participation. After briefly explaining the methods and materials utilized, I present my analysis in three sections, focusing first on how mere participation emerged as helping; second, on the ways in which the notions of Finnishness were enacted in the context; and third, on the habituality of helping and the 'help objects'. All three themes spin around the notions of relationality *and* individuality, presenting a slide or a spectrum rather than stable categories. Lastly, I return to my research questions.

The case: a Nordic diarrhoea vaccine trial in West Africa

Between 2017 and 2019, nearly 750 Finns participated in a clinical trial testing a vaccine against diarrhoea. Traveling to the other side of the world in groups of 10-30 for a two-week period was also required of the recruited trial participants. This was due to the assumed bacterial abundance at the chosen trial site. Some of the trial activities such as sample giving and dietary and symptom log-keeping was done at the destination. The vaccine under development is aimed for use in travellers and infants in low and middle income countries (LMIC). Infant diarrhoea, a key health concern in many LMIC, was the core reason for many Finnish trial participants to participate in the first place. Alongside trial activities, such as sample giving and log keeping, the trip consisted of typical touristic amusements such as organized sightseeing, eating and drinking in restaurants and bars, sun-bathing and becoming acquainted with the place and its people (Huttunen et al., 2021). My ethnographic study observed the trial participants' daily lives over a period of five months in the resort.

The developer of the vaccine is a rather small biotechnological company based in Sweden that cooperates with Nordic and US universities and other actors in the field. The key executors were a Finnish university, a laboratory company, a travel health clinic, and, more unconventionally, a Finnish-African cultural centre. The trial staff present at the West African destination were all Finnish, but bus drivers and a guide, for example, were recruited from the local area. From the perspective of the trial volunteers, encounters with Finnish medicine and health care at the WA destination (as well as in Finland) formed the core of participation – despite their being travellers in Africa.

Background: clinical trials in the South

In the trial literature, ideas about research subjects' complex social webs and social embeddedness are often linked to rethinking the rationales of informed consent and autonomous decision-making that form the basis of medical research ethics. For example, Sariola and Simpson (2011; 2019) demonstrate in a Sri Lankan trial context that it is the family, not a solitary individual, that makes the decision on trial participation, and consequently, that the global practices of ethics need to be negotiated. Additionally, their study demonstrates that trial participants do not perceive independence from the researchers/medical experts as a virtue but, rather, as an impossibility; the expert is assumed to provide guidance and to know what is best for the patient/trial participant. In their study in Kenya, Gikonyo et al. (2008) also emphasize the communal mode of decision-making on participation or withdrawal, suggesting a need for "greater attention to the diverse social relationships that are essential to the successful application of these procedures" (Gikonyo et al., 2008: 708). Less concerned with the question of informed consent, Geissler et al. (2008) address complex social formations in their study of a 'trial community' (consisting of participants and staff) in a malaria vaccine trial in the Gambia, suggesting that relations between staff and participants should be understood as kinship-like: care-taking in the form of shared meals and shared homes were a part of the trial setting. In response, they call for more relational and everyday ethics to complement the formal ones. That trial practices and protocols do not occur in a vacuum but in relation to "participants' broader social experiences" (Lees and Enria, 2020: 580; see also Tengbeh et al., 2018) is often suggested as a key starting point, or sometimes as a finding, in anthropologies of 'overseas' medical research.

With a slightly different focus, various studies (e.g., Kingori, 2015; Abadie, 2010; Petryna, 2009), discuss how structural conditions, especially impoverished living conditions and a lack of access to sufficient biomedical health care, may complicate autonomous choices to participate. Typically, participation in clinical trials also means access to more or less high quality health care or medication. Patricia Kingori discusses the differences between public health care services and those offered by trials/biomedical research institutions in two anonymized contexts of Eastern and Western Africa, showing how poverty, experienced illness and poorly resourced public health care resulted in an 'empty choice' (Kingori, 2015). Similar findings on the ways in which structural conditions may hamper informed consent and autonomous choice come from the US, the result of both hyper-privatized health care and the practice of offering financial compensation to study participants, tempting many to earn their income by continual trial participation (Abadie, 2010).

In light of these earlier studies that focus, on the one hand, on the everyday relations and socialities of the trial participants (or communities) and, on the other, on more structural aspects of health care provision and poverty, in what follows I analyse the relationalities of a trial case that concurrently recruits Finnish trial participants and entails a trip to enjoy the West African microbial abundance. I begin by explicating the methods and material of the study.

Methods and material

This article is written as part of a social scientific research project studying a particular vaccine trial.[3] It is based on five months of ethnographically oriented fieldwork between October 2017 and April 2019 in a small village in a somewhat stable country in Western Africa. The primary material consists of a field diary and 51 semi-structured interviews personally conducted with the trial participants at the trial site. In focus were experiences and views of trial participation, of falling ill with diarrhoea or other disease, of the trip and the place, and of helping, although in some of the interviews a much larger variety of topics were covered. The interviews lasted 45 minutes on average, the shortest one taking fifteen minutes and the longest nearly two hours. The field diary consists of records of participant observation: descriptions and narratives of daily interaction and informal conversations with the trial participants in situations of, for example, eating (and waiting) in local restaurants or hotels, tourist excursions and sitting and chatting in tour buses. In addition to paying attention to people's speech, actions and interactions, as is typical of ethnographic participant observation, I have also drawn from materially oriented ethnography (e.g., Mol, 2002) and have sought to pay attention to materialities of various kinds both in the speech and the daily practices of the participants. As secondary material, I use media accounts of the trial and a survey conducted as part of the research project. The survey targeted the Finnish trial participants and consisted of two separate parts, the first distributed before or at the very beginning of the trial trip, and the second after the trip. Part one gathered basic information about the participants, such as gender, age and occupation; earlier experiences of trial participation and traveling; and motivations for participation. Part two inquired into post-trial views regarding the trial and its implementation, and experiences of participation and the trip as a whole. The first part of the survey received 542 replies, and the second part 493 replies. Even though in close collaboration, the sociological study was conducted independently from the vaccine trial. Jointly with the vaccine study the sociological study had ethical clearance from the Helsinki University Hospitals ethical board.

All trial participants were Finnish citizens, as that was a trial prerequisite. My interviewees seemed to reflect the views of the trial participants more generally, according to the broader picture we gained from the survey. Middle-aged women were slightly over-represented, and a notable proportion worked in education or the health care sector. The majority came from the capital area of Finland as meetings with research staff before and after the trip took place in Helsinki. In light of Finnish statistics, as we describe elsewhere (Huttunen et al., 2021), the participants – and my interviewees – were somewhat average Finns, slightly better educated, and had an interest in science and health, as well as Africa.

The method of analysis of the qualitative material contained elements from thematic and discourse analysis, and 'new material' analysis concerned with how particular entities come into being in particular contextual relations and processes (Mol, 2002; Bennett, 2010). The centrality of the theme of 'helping' became clear during the data gathering and transcription process; in this sense, it arose from the data and served as a starting point for analysis. I coded the data with the help of ATLAS.ti, paying attention during the coding process to how different subject positions were discussed, and how the participants talked about material objects, such as microbes or pencils for donation. An interest in relationality hence in part arose from the data, yet noticing the 'problem' of relationality in earlier research guided me to focus further on what that could mean in my research material; consequently, the smaller codes were collected under subthemes that all discuss aspects of helping from the perspectives of relationality and autonomous subjectivity in this context.

Trial participation as helping; Finnishness and helping; and habits and the stuff of helping

"When I first saw the advertisement, I thought that this is *exactly for me"*, or "I read the newspaper article[4] and immediately signed up – it was just so clearly *my thing*", were astonishingly common ways to begin to answer my question, "Why did you want to participate in this in the first place?" Such a question, and answers to it, do not merely categorize the various motivations for participating in a vaccine trial; they also allow for a more detailed analysis of the 'I' that was so compellingly signalled as taking part in the unique trial. Here, I suggest reading the responses to advertisements or newspaper articles (exemplified above) as moments of hailing, where the individual is called upon to figure as a particular kind of an individual (Butler, 1990). The data suggests that a compilation of the attraction of science, moral ideas of helping and the cultural practices of travel, as well as imaginaries of Africa, were crucial for the sense of being hailed in this case.

Next, I show how discursive and social-material practices of helping infiltrated the context and were a central mode of constructing the self as a relational subject. Yet, simultaneously, through notions of helping an individual, even autonomous, self was also enacted – in part, through a typical Nordic narrative of strong individuals.

Participation as helping: from centering the individual self to distributive agency

Those whom I interviewed or talked to more informally considered mere participation in the scientific project, the vaccine trial, an act of helping. Many emphasized that they cared about the health of African children, not that of travellers as prospective vaccine users. This view was undoubtedly encouraged by the media coverage of the trial and the briefings, held at the beginning of each two-week trip to the village, in which the responsible doctor expressed gratitude to all the participants, while mentioning how many children die of diarrhoea annually. On such occasions, both the simultaneous 'individuating hailing' and the collectivity of the effort as a key to the trial's success were clearly visible.

Many of the participants worked in the health sector or education, and attributed to these backgrounds their views on why a vaccine for children was something to which they wanted to contribute. As is typical of most Finns' attitudes toward vaccines, vaccination programs were described by many as key factors in improving public health (e.g., Väliverronen et al., 2020). A focus on the wellbeing of children, societally, but also on participants' personal and occupational lives, frequently featured in interviews and discussions. Merja, a school teacher near retirement, emphasized how important helping children had always been for her. The interview took place on an otherwise empty forenoon beach, the ocean glimmering and roaring some fifty meters from us and the smell of sun lotion floating in the air. Laying on her wooden deck chair under a sunshade, Merja took a long look at the ocean and, after a silence, responded to the suggestive question I had posed with a firm "Yes, I really feel like we are doing something important here."

In this context, one's mere bodily existence, underlined by the concurrent sunbathing, becomes an act of engaging with the inequalities of the world. This could be read as a crystallization of 'white saviorism' (Jefferess, 2015; Benton, 2016), as one's desire to help those considered poor and racialized as non-white becomes an assumed state of affairs and a personal experience. Without wishing to downplay the significance of how race is produced in such events, this could, however, also be understood as an enactment of biological global citizenship (e.g., Rose and Novas, 2005) of a kind: in modes that foreground the biological body as active and as activity, rather than passive background. What I want to emphasize in Merja's response to my question is the 'we': that it is necessarily a collective effort of which the individual is part and whereby she gains her significance. Vaccine trial participation as heroic action entangled with the making of respectable and moral selves – a particular desire to help enmeshed with biomedical knowledge production – has been previously recorded in Sierra

Leonian and South African contexts (Tengbeh et al., 2018; Dixon and Tameris, 2018), demonstrating that such processes are not a unique feature of this trial. While I suggest that individualized attempts to make moral and virtuous selves were at play in this situation, and emphasize the contextual specificities in regard to the similarities in these processes with other contexts, the collectivity or relationality of the 'we' should also be addressed.

While I believe Merja was referring with the 'we' to her trial participant companions, a strictly defined human collective, other modes of signaling ideas and practices of relationality were likewise in play. The repeated references to diarrhoeaas agential – such as, "If I got diarrhoea I might feel that I've actually done something", or "Well, this [diarrhoea] is what I'm here for, now I've done my share" – disrupt an idea of the self as autonomous or (successfully) intentional (see Bennett, 2012). In addition to showing how helping was experienced in a very embodied manner, such accounts point towards the notion of distributive agency which Jane Bennett (2012; 2004), for example, describes as locating agency in relations between *things,* and attributing agentic or effective force to non-human beings as well. Here, both diarrhoea and the independently functioning gut, and microbes as the non-human actors causing diarrhoea (see also Huttunen et al., 2021) were assigned such a capacity, admittedly unsettling the idea of the individual self as an autonomous agent. In another interview, I asked a trial participant whether she considered her participation to be voluntary work of a kind, and her response, accompanied by a small laugh and a tap on the belly, was, "Well not really, it's not even me who is doing something!". In yet another interview, with Aura, a woman in her forties, the answer to the question was:

> ...in a way, that was the reason [to participate], I wanted to be of use to humankind – but maybe this is a little too light to be voluntary work, sitting on the beach in your bikini! [Laughter.] I wouldn't categorize it that way. More like, you lend your body to medicine, and hope that it results in something good.

Although in the latter example, the interviewee also expresses disconnection between self and body, I suggest that these remarks incisively express how the individual self was in a sense set aside, as the human subject was only one party, or actant (Bennett, 2012), in the practice of helping.

Another central mode of how 'mere participation' became a form of helping was through tourism; one contributed by being a tourist. Often, the participants referred to themselves as "not just ordinary tourists", and the trip was "not just any holiday trip". Instead, it seemed to constitute the participants as helpers in multiple ways. Mentions of the positive effects of their travel to the village were common, along with the reservation of not wishing to contribute to the spoiling, often seen as "westernization", of the place. In an interview with Tiia, a kindergarten teacher in her thirties, an optimistic atmosphere prevailed, although she also described how terrible it was to see the poverty and suffering, especially of the local children. She described her thoughts in the following way, speaking from the comfort of a deck chair, on a cooling evening:

> T: I decided to join when I saw the advertisement in the newspaper in the summer, about this trip, or the very first article that was written about this. So I thought right away that this is exactly my thing. And, because I wanted to go to Africa, after my previous trip to [East African country], and then the significance of it, that you can help children, you can do something good at the same time.
> …
> K: What did you think of that, about building a laboratory somewhere, quite far from Finland, and…
> T: I think it was good, the way the article described what the village thought about it, and that it had been carefully explained to the village why it is being done here, why there will be lots of light-skinned[5] people coming here. Then, I was like, it is OK for this place, that we come here, and we won't mess anything up.
> K: And have you thought about that now that you're here?
> T: Yes, I've thought about it, I think this is bringing quite a lot of good things to this village. Because after all this brings… we bring an awful lot of money to this place. So it is a good thing.

Effectively exemplifying the "exactly for me" response mentioned earlier, this excerpt clarifies the multiplicity of the event: how it emerged as science, as helping, as travel, and as Africa, and how these spheres were constantly enacted and re-enacted – for example, in such utterances. Here, the individualizing discourses and practices are forcefully present as Tiia describes her multilayered choices: the 'doing good' is understood as the individual's action and choice, and as a delightful side product, insofar as she regards consumerist ideas of tourism as a means for development. Casting oneself as a morally sound, caring individual seems strikingly successful here. If the expressed concern for 'the village' is taken seriously as a longing for responsible global connectedness, this statement also shows the limited, and somewhat naïve, attempts to position oneself in such forms of subjectivity. This, however, should not mean that such a longing in itself is naïve or patronizing.

The participants' being Finnish welfare state citizens – and often, as in the examples above, employed in care work in the public sector – provides an interesting viewpoint in relation to previous studies on the ways in which structural conditions may hamper informed consent on trial participation in Southern contexts (Kingori, 2015). Here, the structures of the welfare state matter in a rather different mode, yet are not insignificant for understanding both trial participation and the ideas of the subject that are generated. In the Finnish context, the state has been theorized as not only regulating and governing, but also, in some cases, as enabling and allowing a positive attachment or embeddedness to the 'social' without complete denial of individuality, (e.g., Oinas, 2017; Homanen, 2016). Here, the welfare state (ideology/background) enables a particular kind of individuality, one wherein collectivity and social belonging are integral. Yet it also demands and generates a strong, charitable (and gendered) individual who cares and works for the common good (Sulkunen, 2009) – not only in nationalistic terms, but as a caring, global citizen. Relationality, practiced here in voluntary helping, is an enactment of an individuated self, hence, one that is thoroughly relational.

Finnishness as a location for the helper-self: 'Finnish exceptionalism' or situating the relational self?

Among the participants, Finnishness was a constant point of reference, but not in any univocal way. Being a Finnish citizen was a requirement for participation, but Finnishness also functioned as an attribute for particular kinds of positionings in regard to histories of colonialism, privilege, and the obligation and opportunities to 'help' – as well as a way of referring to particular observed or assumed differences and characteristics (of Finns as not very sociable and rather silent, for example). Here, I have analysed modes of discussing and enacting 'Finnishness' in conjunction with ideas of helping, suggesting a reading of these enactments of Finnishness as (helpful) exceptionalism (Irni et al., 2009; Rastas, 2012), yet one that points to Finnishness as situated accountability.

The notion of Finnish or Nordic exceptionalism has been suggested in order to describe a particular attitude towards notions of colonial histories and race/racism articulated in national discourses. Specifically in relation to Africa, Anna Rastas (2012) has traced Finnish exceptionality in historical and contemporary use of the N-word in Finnish school books and in the way certain cultural products are discussed, revealing a tendency for Finns to consider themselves outsiders to colonial histories, and for race and racism to be understood as non-existent in Finland. In addition to an 'aspiring whiteness' – the desire to belong to the 'West' (Oinas, 2020: 5) – such ideas of exceptionalism can be understood as typical of Finnish (and Nordic) formations of whiteness. Although here it is not a question of racism within Finland, versions of exceptionality were narrated and enacted among the trial participants. The trial setting itself generated ideas of exceptionality in a manner that connected the uniqueness of the scientific experiment and Nordicness/Finnishness. Indeed, the special nature of the endeavour and of the people participating in it were propounded in the official briefings of participants, and in the Finnish media. In the ethnographic material, two ways of enacting this exceptionality were particularly identifiable: that of repeatedly raising the horrors of slave trade and colonialism, while noting that at least Finland never had colonies of its own; and that of assuming that 'we' have something to give to the 'locals', specifically in terms of education and gender equality, as we are Finns. Here, I focus on the latter mode as it is directly links to the notion of helping.

Among the trial participants, the assumption that 'we' have something to provide in terms of gender equality was a repeated one and functioned as a mode of enacting the notion of Finnish exceptionality. It is precisely the repetition of such utterances that is important here, not because quantity always matters, but because it suggests the habituality and normalization of particular ways of seeing and knowing (Ahmed, 2007). Branding the Finnish state as 'woman-friendly' (e.g., Jauhola, 2016) is common not only in the media, but in the chat among participants who attributed a keen interest in gender equality to being a Finn. "For us, it is so self-evident that we are equal, that's why it's so difficult to see this; it really makes me angry and want to do something", as a middle-aged participant commented on hearing a lecture-like speech by a local actor on girls' issues after a mini-tour of the research site in the village. Getting girls to school was a motivating intention throughout the trial, one supported by both the participants and trial staff. Yet writing one's name on an email list for a future support group for local girls as the tour bus headed back to the hotel was sometimes the most marked materialization of this intention. Bemoaning the fact that girls often still remain at home while boys go to school, or that girls have to cut their hair short around puberty if they do go to school, was understandably a more available mode of positioning oneself in the gender equality discourse. The intense desire for change in the area of gender equality is especially notable given that the participants often expressed either respectful awe or calm interest toward other practices observed as different, such as religious, vodun-related events.

Education, another Finnish export (Schatz et al., 2015), was also often cited as a "Finnish value" and its support was justified by the knowledge of how important equal education has been for the country's success story – a typical narrative in Finland. Apart from their connection to nationalistic discourses, such views may also stem from the 'common knowledge' conveyed by the development industry that education is the key to change. Such statements were constantly brought up as the participants wondered what could be done to alleviate the poverty they witnessed. Here too, references to personal experiences and appreciation of the Finnish education system prevailed. Many brought or bought pencils and notebooks for the schools and, additionally, schools were selected as receivers of more systematic charity. Collecting money for solar panels or Wi-Fi for schools became an activity in which many of the trial groups took part, typically culminating in a visit to the school when the object was donated. Photographs taken to witness the event and applause by groups of pupils were the norm.

As these examples show, Finnish exceptionality as a particular mode of enacting (Finnish) whiteness is here about attaching oneself to narratives of Finnish success stories of gender equality and education. These modes allow for a detachment from historical-political trajectories of race and racism, and generate hierarchical modes of relating, as 'Finnishness' becomes a position of superiority in terms of gender equality as well as education. However, other modes of relating from a position of 'Finnishness' were also sought and enacted.

The following example illustrates how a gesture towards 'us' and nation does not exclude aspirations for a more global relationality. Maija, a teacher in her fifties, considered helping as 'our' duty, although not so explicitly referring to Finnishness here. For Maija the notion of Finnishness described what she saw as the boring characteristics of Finns – pessimism, constant worrying, the need to have everything in order and under control – something she longed to get away from, much as Liisa Malkki (2015) describes in her account of Finnish humanitarians. In Maija's short account, various positionings overlap in considering the 'why' of helping:

> K: And why do you want to help, like you said?
> M: Well I'm a teacher! That's like a basic human need, I think. Like, if we've been born with a silver spoon, or a dozen silver spoons, compared to these [people], then goddamit, if we can't at least do something. I think it's just part of the game. It's like a human duty, we're one, after all. Or that's how it should be seen, I think. I've probably always

> thought about it this way, but then I'm a teacher too, so it probably adds to it.
> K: So it's like an everyday thing for you?
> M: Yes, yes. It's my job to think of, as I'm a teacher, to think of what is right. So not only that everyone gets the same, but what is right. And this [trial participation] is like a tiny drop, but in that direction anyway.

First, and last, Maija attributes her will to help, and interest in morality, to being a teacher – as already mentioned, a valued profession in Finland, where education is an export and often narrated as one of the cornerstones of the success of the nation (Schatz et al., 2015). As such it does resonate with the analysis above, yet also suggests a rather specific location and narrative of the source of one's interest in helping. Interesting here is the way Maija suggests that helping is a basic *human need*, and *a human responsibility* as *we are one* – a particular way of relating to other humans through a universal connectedness. The need seems to suggest the fundamentality of being in such relations, not merely a need to reach for more lively relatedness (Malkki, 2015). Talking about *us* as being born with silver spoons in our mouths is an attempt to be simultaneously accountable for one's privilege, even though helping is a universal human responsibility. Referring to 'us' is, therefore, not merely about enacting exceptionality, but about situating oneself in broader structurers of inequality. Yet such an account seems inevitably to stabilize subject positions, particularly the infamous 'helper' and 'helped' (e.g., Redfield and Borstein, 2013), with the position of the 'helper' racialized as white (Benton, 2016; Jefferess, 2015). A comparative perspective is taken for granted, introduced with "a dozen silver spoons, compared to these [people], then goddamit, if we can't at least do something". For Maija, helping materialized as participating in joint solar panel donations and delivering French books, pencils, sharpeners and children's underwear to a local orphanage, which was a popular and debated receiver of donations. Children, for Maija as for others, were a self-evident object of help. As an illuminating background, Maija described herself as a mother and recent grandmother, and mentioned her exhaustion with being responsible for everything and everyone, with someone always needing something from her, including at work. She described her nearly desperate need to get away from all that and have a moment of rest as a key reason for her joining the trial trip, but there too, being a responsible person/helper is clearly enacted. Inevitably, various relation(alitie)s are enmeshed in each situation, and moreover, as Maija's case suggests, their enactments are gendered processes.

Habits of helping and vibrant stuff

As has become clear, the trial participants were faced with a need for constant negotiation over how to relate to helping: whether it is something self-evident and simple, something highly affective arising in that particular place, something endlessly problematic – or something from which one can just maintain a firm distance. Much like in the previous section on ways and attempts to situate oneself as a Finn/European, what seemed rather clear is that different kinds of practices of helping always do something important to the helper; they fulfil a need, often one for belonging and connection (Malkki, 2015). Here, I suggest that the helper-individual emerges in the multiple entanglements with all kinds of material objects, not only with other humans or in merely discursive formations.

Although the clear majority engaged in helping in one way or another, for some, the intensity was more powerful. They were the ones who often took the lead in what the group in question would donate and how, and disseminated ideas of what might be a good way to help the local people – usually children or women, as indicated above. One of these enthusiastic helpers was Emma, a woman in her thirties, whose original plan had been to "chill and read books by the pool". Even in advance, however, she had already recruited some friends to donate money for certain needs she had seen in the trial participants' Facebook group, and conceived of the vaccine trial participation as a modest act of helping which could justify the flight. This was something often mentioned, especially by the younger participants in their twenties and thirties, as travelling was regarded as something rather troubling that needed justification. After Emma had detailed her many activities and plans to help, she gave an interesting answer to my question of why she was so keen on helping there:

> Well, I don't know, I guess I've just always been like this, and I think it's not, it's like brushing teeth to me, I don't even think about it. But perhaps there has been a peculiar energy-spirit-atmosphere here that has just taken me there, but I haven't thought about the issue at all! I've just been doing it. It has been so natural somehow. I don't know, I've been maybe so addicted to all kinds of voluntary work lately, it's really addictive you know, like, it pulls you in, and it's so simple in a way; there's no one telling you what you must do, you can do what you want to, it's voluntary.

I find three things of interest condensed into this utterance: first, the described habituality and naturalness of helping; second, the desire for individual autonomy; and third, the 'atmosphere' that seems to move the speaker's body so strongly, taking and pulling it. As Emma compares helping to brushing her teeth, she seems to suggest that it is something nearly automatized, even normalized, for her. As she is saying this as a white Finn in an African village for the first time, Sara Ahmed's notion of whiteness as a (bad) habit that becomes an unnoticed background for experience (Ahmed, 2007) is helpful. Here, this phenomenological notion shows how effortlessly the world becomes white, that is, inhabits the white body (Ahmed, 2007), even in a context of a non-white society. Whiteness works through its invisibilization even when it is hyper-visible, as was the case in this context (Benton, 2016). Hence, the acts of helping, precisely purposed to affect other people's lives, may become so natural that they do not even require stopping to think of such effects.

However, instead of advocating a totalizing reading of whiteness as all-explanatory of the event/statement, I suggest that the described feelings of naturalness and easiness are also telling of an attempt to settle into relations with others in an effortless manner. Instead of merely being a neoliberal project involving the conscious making and branding of a (benevolent, moral, useful) self, one seeks a mode of being and selfhood that is not troubling or burdensome, that does not require active work on the self. Yet, as Emma simultaneously does not want anyone "telling you what you have to do" and values a state where "you can do what you want to", longing for easy (human) connectedness does not exclude a deep desire for, and enacting of, individual autonomy. Instead of considering these longings and modes of constructing a self as contradictory, or in terms of one-directional causality, they should be seen as co-emerging. Importantly, as I attempted to exemplify in the first place, racialized relations of power further complicate settling into such easy connectedness or individuality.

The place, the village, its sounds, smells and colours – and aspects less simple to identify – were powerful, affective and effect-generating, as many described with confusion. In the excerpt above, Emma is describing a force, a "peculiar energy-spirit-atmosphere", that is taking her in different directions, which indeed seems to complicate the simplicity of comparing helping to brushing teeth. It is a question of being affected and not perfectly knowing what it is that has such a strong effect. The material environment, in its multiplicity, was affective in ways that are not reducible to *discourses* of 'Africa' or development, yet not completely detached from them, an observation that brings the discussion to how some ordinary objects, or *things* (Bennett, 2012) take part in agentic relations of helping. Although the constant presence of 'aid objects' has already been mentioned, the activity, or vibrancy, of such material things can be further underlined.

Beside samples and laboratory equipment, a flow of all kinds of objects became a nearly integral part of the trial trips. As I have shown, the participants brought school notebooks, pens and children's clothes with them to be donated to those in need in the village. The cultural centre that was part of the organizing team instructed that these kinds of objects would be useful, and they were also in charge of distributing the donations at the site so as to avoid haphazard charity. In addition to the participants being, to some extent, obedient to instructions to be sensible in their giving, the role of the material stuff seemed not to be merely about donating something useful and needed. Interestingly, objects of various kinds suddenly seemed to turn into 'help objects'. For example, when I asked Nea, a student in her early twenties, about her helping initiatives, her response was that she had not brought anything but had given empty water bottles and nuts to the kids. A similar example is that of Teija, a middle-aged woman working in health care. In touched tones, she described a memorable event during the holiday:

> When we were there in the salt village, and there, we were all totally like, "Oh no, now we don't have the notebooks, and we could've brought children's clothes, and we could've brought this and that." And we didn't have that. But then I thought like, should tourists always have something to take there, or was there some deal that they get some share of what we paid? Probably someone does, but who then… So then, I had this scrunchie, or hair clip, there. The children got something, some gave pencils from their purses. So you get this embarrassed feeling, you know…. That people start digging stuff from their pockets. So there was this older woman sitting nearby all the time. It was an ex tempore thing, I was first like, "I don't have anything", but then I realized that I do have the hair clip, and I asked if I could put it in her hair. And her face was like that of a happy child's.

In this quote, despite the reflexive comments, actions take place, such as digging stuff from one's pockets to distribute and infantilizing the recipient of the hair clip by comparing her to a "happy child", that create hierarchical positions. Concurrently, the animated way in which Teija described herself giving away her hair clip shows the significance of seemingly random, material stuff (Bennett, 2004). As these snippets exemplify, ordinary (use) objects, nuts, water bottles and hair clips, emerge as 'help objects'. Instead of bemoaning the idea that one is helping when giving nuts or one's leftover bottles, I suggest it reveals the agentic role of everyday stuff in the constitution of relationality and subjectivity. It is not merely about human intentions (to do good), but also enacted in compilations of all kinds of stuff, not only human. These examples and the intensity of 'stuff' effectively demonstrate that helping is both discursive *and* material (Hojgaard and Sondergaard, 2011; Barad, 2007): the nuts and the bottles might not emerge as help objects without the forceful discourse(s) of helping African children and saviourness (e.g. Benton, 2016), yet they are key, even agentic, in maintaining and enacting such discourses and practices. The thingness and object-nature of the material stuff suggested by Bennett (2004; 2010) hence seem inseparable here, yet "the active participation of ordinary objects inside these collectives, and inside the collective called the I" (Bennett, 2012: 258) becomes clear.

Conclusions

With a focus on social scientific studies of clinical trials, I started by suggesting that empirical studies on 'relational subjects' tend to come from 'elsewhere' – often, from the South, depicting a different, more relational ontology to Southern subjects. I argued that, although importantly problematizing the (universalistic) tenets of medical research ethics, such work may also (re)produce essentializing ideas of the South and of difference, and further, enforce the idea of the autonomous subject regarded apt in the West. By attending to the notion of helping, I have discussed what, then, relationality and distributed agency might mean when looking at Nordic, specifically Finnish, trial subjects. Further, I have suggested that the notions of (social-material) relationality or social embeddedness and of individuality and processes of individuation do not need to be considered in dichotomous terms, as contradictory or mutually exclusive.

As for example van der Zaag (2017) has suggested, a clinical trial requires, but also generates multiple materialities, and material politics. Therefore, for STS scholars too, it is crucial to study also those relations and practices that are not in the centre of scientific practices. Here, I have shown how a diarrhoea vaccine trial transformed into a web of humanitarian charity practices, idea(l)s of benevolence and a quest for ethical relations in a context of tangible inequality. First, I described how mere trial participation was regarded as helping, thereby underlining the importance of the individual helper self. However, agency was distributed among collectives of humans and non-humans in that mode too. I then discussed how Finnishness was enacted in connection to ideas and practices of helping. Using the examples of education and gender equality as key interests in helping, I suggested that 'Finnish exceptionalism' is a racialized enactment of relations of helping. I also showed how modes of more situated accountability as a Finnish helper were sought, yet easily interrupted by white habits of Finnishness and/as superiority. Lastly, I attended to the habituality of helping as a white habit (Ahmed, 2007), as a search for easy connectedness *and* autonomous individuality, and as the vibrant power of the material environment, and also discussed the ways ordinary objects turned into help objects and took part in the formation of the helper-selves.

Hence, I suggest that the practices and ideas of helping enacted in this context produce particular kinds of subjects: always relational and distributed, emerging in undetermined social-material relations. Simultaneously, the trial context calls for and requires individuals capable of informed decision-making and responsible choices. In other words, in the material, simultaneous emphasis on an individual, unique helper self and the self as a human and non-human compound (Bennett, 2012; 2004) are present. I argue that an intentionally acting, individual helper self is enacted, yet immediately troubled by the multiplicity of 'actants'. Following Bennett (2012, 2010), this unsettles the more simplistic notions of causality and, therefore, those of responsibility. Importantly, processes of racialization cannot be seen as external to these processes of individuation and relationality, or of helping (Jackson, 2013). As I have shown, relationality may be considered as a(n ontological) starting point, yet is constantly in process, and requires empirical interrogations of the 'what' and the 'how' (Meskus, 2015) in order to properly dismantle problematic notions of an autonomous subject that tend to carry racialized prerequisites.

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Notes

1 Due to anonymity reasons, the exact country is not named in this article.

2 Foundational documents are the Nuremberg Code (1947) declared after WWII, the Belmont Report (1978) issued after the Tuskegee Syphilis Study, and the Helsinki Declaration (1964; 2013) – codes of conduct that were born out of the necessity to protect human subjects from violations of their physical and mental autonomy. This article is by no means suggesting that such guidelines are not essential; rather, it engages with anthropological discussions of how the implementation of these guidelines materializes in some contexts.

3 SCRIBE: Socialities of a vaccine trial: tourists, researchers, microbes and local communities in Benin. University of Helsinki, PI Salla Sariola.

4 The biggest newspaper in Finland published a long article about the vaccine trial in spring 2017 as signing up for trial participation began, which was repeatedly referenced in interviews and discussions with the trial participants. On the Sunday the article was published the trial got thousands of submissions of interest.

5 In the Finnish language, the terms 'white' or 'black' are typically not used to refer to people's skin color, as they tend to be considered to imply a racist tone. Terms that directly translate as 'light-skinned' and 'dark-skinned' are more typical.

Dimbath Oliver (2022) Oblivionism. Forgetting and Forgetfulness in Modern Science. Leiden: Brill. 302 pages. ISBN: 978-3-8467-6573-3

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“I still dream of Orgonon” is the first line of Kate Bush’ hit ‘Cloudbusting’. The song is inspired by Peter Reich’s *A book of dreams* (1973), a memoir that recalls life at the research lab Orgonon (Maine, USA) devoted to the study of orgone energy. The study of orgone, the face of the field, Wilhelm Reich (Peter’s father) and the links between Reich and Einstein are no longer part of the scientific corpus. We have forgotten them and if I would not greatly appreciate Kate Bush’s music, I would have been as oblivious as the rest.

Oblivion, the problem of not knowing something anymore, and oblivionism, the critique of systematic or intentional forgetting in modern society, stand at the heart of Dimbath’s sociological analysis. Dimbath offers the reader a sociology of a loss of knowledge, which does not restrict itself to forgetting or forgetfulness in modern science, as the subtitle suggests. Modern science, to Dimbath, is a case study hinted at throughout the first chapters of the book, but only moved into the spotlight in the very last chapter.

Dimbath offers a dense text that oscillates between more philosophical and sociological contributions and continuous encounters between oblivion and highly theoretical manifestations of knowledge, time, and memory. Through various excursions into philosophies and sociologies of time and memory,[1] Dimbath presents us with a score of concepts that orbit oblivion in complex interwoven patterns and that co-define and shape various co-existing notions of what could be and are oblivion. He moves through individual, social, institutional, cultural and political conceptualisations of what it means to forget and have forgotten.[2]

The core of the book deals with the development of a sociological theory of memory and remembrance, in continuous exchange with and connection to oblivion. Dimbath casts a very wide net in both sociology and philosophy and continuously moves between classic and contemporary theory. Dimbath distinguishes between three dimensions of social memory, declarative-reflective, incorporated-practical, and objectivist-technical (p. 99). While there is a lot to say about the conceptual rigour through which Dimbath assembles his sociologies of memory and oblivion, the placement and understanding of memory and forgetting in science warrants primary attention here.

To Dimbath, science is the perfect site for testing his conceptual apparatus, given its “particular emphasis on permanently referring to the past” (p. 189). He studies oblivion in science as a conceptual pilot; armchair sociology as it were, never plunging himself into specific practices or representing them though data. Dimbath discusses “the literature”, how it stores knowledge and the selection processes involved in retrieving knowledge from it, how completeness ideals and practices of selection and replacement create both social memory and forgetting in the sciences. Where not accumulation but replacement of knowledge, theories or paradigms constitute scientific progress, forgetting is a requirement.

The forgetfulness of science knows many shapes: ranging from innovation as creative destruction to a pathological lack of self-reflective abilities. Oblivion in science, so Dimbath argues, can be metaphorically represented in the form of a leak – a problem that needs to be fixed, or a form of cleansing – a desirable process geared toward some idea of self-improvement. It is not solely a characteristic of internal selection processes in science, but is also shaped by external dynamics, such as economic thinking imposed onto the governance of science that favours selection based on success, or political steering, that favour selection on desirable (fields of) specialisation. These selection processes can manifest themselves in the form of evaluation regimes, which specifically seek out oblivion: work that does not fit an agenda, or a mission, or work that is considered poor. Even publication bias (Dimbath does not use the word) can be explained this way: by a desire to forget unsuccessful experiments. Selection based on success favours remembrance of the successful and forgetting of the rest, producing the Matthew Effect and elite journals in the process. Forgetfulness in science is also intentionally (in part, at least) performed via citation practices, or rather, selection process that result in not citing a study, and on a larger scale, via Kuhnian paradigm shifts. Dimbath extends this into the moral realm, where tabooing of certain research areas via ethics committees or political actors helps to cast them into oblivion.

Dimbath speculates that science's relentless productivity might, on the micro-level of the individual scientist, be sparked by a desire to escape oblivion and be remembered for a contribution. He also finds room for some critique on the scientific system, the meso- and macro levels, where precarious employment and forced mobility produces forgetfulness in scientific organisations. On a similar institutional level, the design of curricula and canon not only creates descriptions of relevant knowledge, but also preselects what may be and should be forgotten. This shapes the state-of the art, the status-quo and simultaneously, cleanses science of unwanted epistemic content. Systematically not citing something renders it invisible and ultimately forgotten. If knowledge becomes canon, its origin can be forgotten (black-boxed). If it does not become canon, it can be forgotten completely.

"Oblivionism" does not offer a single comprehensive analysis, but rather offers a large numbers of small and fragmented "applications" of Dimbath's conceptual apparatus to scientific practices, each of a few paragraphs only. Many, most actually, are quite illustrative and offer a new and refreshing perspective on issues well known. Some overstretch the idea of forgetting somewhat, for instance the description of the reorientation of existing knowledge and personal history in different funding applications (p. 228). Does a switch in rhetoric constitute forgetfulness? Does updating textbooks and personal collections, curation of databases and literature all constitute desires to remove and forget? Dimbath does briefly touch upon self-presentation through publication lists and the attempt to make audiences forget of less prominent publications. He even explicitly mentions "career-damaging behaviour" (p. 234), and (successful) plagiarism as a way to forget about an affected originator (p.235). However, we learn little about how scientists and the scientific community seek to forget fraud (erase it from the corpus and expunge the fraudster from its ranks) and whether, as a consequence, reparation is possible. The same goes for retractions in literature – how do we understand them as a mode of oblivion?

How something is forgotten, what is forgotten, who is forgetting, at what social level something is forgotten, what may be retrieved and how, whether oblivion is object- or subject-related and whether it is series of conditions or a process – Dimbath slowly takes the reader on a strenuous journey to tick off each and every one of these questions with the help of an army of theorists and theories – on taboos, organisational learning, silencing, reframing or restructuring and more, including a small meta-journey into forgetting about oblivion. The result, a classification of oblivion under three headings: forgetfulness, wanting to forget (volitional oblivion) and making one forget. Hiding under these three labels are huge numbers of differentiations of oblivion and immense conceptual detail. However, this complexity and conceptual detail makes the book difficult to process and access. It is somewhat of a challenge to read and process and many might feel tempted to fast-forward to Chapter 4, where the analysis of science starts. The book even lacks an index that could help facilitate access to its complexity.

After extremely lengthy theoretical discussions, the four-page conclusion confirms that Dimbath's lens of oblivion offers value to sociology and science studies. When science moves forward, we usually wonder what that means. We can also ask what is lost along the way. Dimbath offers us a collection of tools to answer that question, so we do not have to rely on Kate Bush' eclectic reading habits. How these tools work in empirical studies is an open question, for all of us to answer.

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Notes

1 Featuring Plato, Aristotle, Plotinus, Augustine, Bergson, Ricœur, Husserl, Heidegger, Derrida, Durkheim, Mead, Halbwachs, Parsons, Giddens, Luhmann, Elias, Weber, Ebbinghaus, Freud, Barnes, Connerton, Weinrich, Adorno, Lübbe, König, Nietzsche, Gadamer, Eco, Goffman, and more.

2 Some of these thinkers, whose work is briefly touched upon by Dimbath, have very little to offer to the development of his conceptual apparatus. He is mostly transparent about this, which sparks comparisons to the negative results in experimental studies: displays of what ultimately proved to be futile are still of intellectual value, even if only to avoid others to take the same path.

Tupasela Aaro (2021) *Populations as brands – Marketing national resources for global data markets.* Cham: Palgrave Macmillan. 225 pp. ISBN: 9783030785789 (eBook)

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On *Populations as Brands*, Aaro Tupasela invites the reader to dive in the complex world of marketing and branding in the particular field of biomedical research – which entails the so-called basic research, but also other forms of research dependent on data donation in a variety of forms (medical data, lifestyle data, social data, and biological data).

In this book, the author has gathered his 20 year-long research in the topic of biomedical research and population branding, recurring to many examples from biobanking activities to the data intensive society, making use of a privileged position to perform an almost permanent ethnographic-like study with data coming from different actors and scenarios.

This is a quite relevant contribution for Science and Technology studies, expanding its impact to nation studies, citizenship, and commercial practices emerging from health settings in the context of bioeconomies.

Although it might work as a summary, the book goes further in offering concrete details, and empirical data, of two Nordic countries – Denmark and Finland – that assume the role of case studies.

As the author mentions, Nordic countries are believed to act similarly in research and health arenas, being described as a paradise for researchers. However, the reader is presented with the concrete examples of how Denmark and Finland have set up different strategies for commodifying genetic and medical information, promoting biological and non-biological data donation. Here, the empirical data presented is a clear add on, supporting not only the proposed argument, but also highlighting the different manners to capitalise existing resources, under population branding.

Also, it shows how citizenship is brought to the arena of marketing, making clear the appeal to cultural and nation values in order to serve commercial intentions. It brilliantly illustrates how samples, data donation, and data produced for health purposes are integrated in an open-ended value chain, enabling the addition of different products, transforming data, and particularly health generated data, as an important asset of a country.

The book continues, in an original and applied perspective, the argument and the discussion of tissue economies proposed by Waldby and Mitchell (2006) clarifying how they are instrumental to the contemporary notions of nation and State, under the paradigm of data-driven societies.

The chapters work independently, but together they offer a wide and multifaceted perspective. Chapter 1 starts with an overview of the main concepts and their theoretical discussion. The introductory chapter serves, as well, as a theoretical anchor for the concepts discussed throughout the book such as body commodification or the relevant relationship between citizens, institutions, and the State.

The second chapter is thus oriented to explore how biomedical research is a fertile ground for population branding and marketing. Quite interestingly it starts with an exploration of the symbolic imagery carried by political discourse. At the same time, it introduces how the branding strategies make use of discourse to construct shared narratives of originality and authenticity. While States operate differently than GAFAM (Google, Apple, Facebook, Amazon and Microsoft) companies, the model to derive value from data could be similar. However, although GAFAM could have more aggressive market approaches, the resources already at disposal, the better chance to manage the constraints in the legal field, allied to a powerful construction of narratives, promote different abilities to make nations competitive in global data markets.

Chapter 3 entails a discussion on practices of valuation, exploring the integration of the notion of Nordic exceptionalism in two case-study countries – Denmark and Finland. Departing from the symbolism of the Nordic gold mine for researchers, exceptionalism is a feature necessary to develop a coherent narrative. It is, in this context, that the ties between science, biology and the social are indissociable, with genetic research defining and circumscribing the features of national identities. This is key to establish a *cartographic gaze*, as the author mentioned, enabling to strength the surveillance society through situated data.

Deepening the argument, chapter 4 focus on the relevancy of identity construction and the factors differentiating Nordic countries. In doing that, the construction of unique nation identity and their underlying values turns easier to understand the mobilisation of historical roots and heritage in identity construction. It is also crucial to observe how scientific research assume a relevant role in the procurement of niche markets and consumers, which gains a considerable expression in the field of rare diseases.

Right before the end, in chapter 5, citizen engagement is also brought to the fore. The problem of public opinion is addressed from a market perspective, pointing that the States' approach to the public promotes market campaigns that favour branding strategies. While, in other chapters, public trust and public engagement were invocated as a central pillar for effective branding strategies, the last chapter stresses the inherent problems brought by the public sphere when concerns arise, and how they are promptly addressed and integrated in the market campaigns. In this scenario, citizens are portrayed as being passive actors, which is not left without criticism, signalling for the possible erosion of public trust as a possible emerging problem. This topic is further debated in the conclusion, calling for a special attention in the near future.

The arguments presented are also critical to understand how healthcare has evolved in the last decades, in the direction of body commodification and product commercialisation. However, the book does not address how these population branding strategies impact the organisation and provision of health services. Also, in this sense, the mention to 'surveillance capitalism', 'cartographic gaze' or even the idea of the entire 'population as a cohort' are in line with the expansion of 'medical gaze' (Foucault, 1963) and 'molecular gaze' (Rose, 2007), which could be an argument to be explored, contributing to the debate on the entanglement of health and market fields.

As it is particularly latent on the last chapters, the challenge of public trust might change in the coming times. This issue deserves further exploration, since it might influence not only the organisation of healthcare services, but the way public engagement is addressed by public institutions, thus, conditioning the way branding strategies are put into practice.

Although the author is quite clear in presenting the book as a case study, this narrative will be difficult to transpose to many other European countries that have not reached such well-developed Welfare State or where data economies are far from being established.

Overall, this book offers an essential reflexion on how countries are defending and shaping their identities, in a global world, relying on their own cultures, capitalising them into selling products as promoting their unique nation identity. Applying the branding paradigm to populations opens the opportunity to analyse how countries are coping with new developments on science, technology, and innovation, transforming national assets into capacity to compete in global markets.

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