Urban Futures with 5G

British Press Reporting

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Executive Summary

Fifth Generation mobile technology – or 5G – is at the centre of multiple controversies. Huawei, as a Chinese 5G equipment manufacturer is being implicated in international trade wars and there are suspicions of foreign interventions in domestic affairs. 5G is also linked to long-standing concerns about potential health hazards of electromagnetic frequencies. This controversy gained momentum in early 2020 when conspiracy theories conflated the global spread of Covid-19 with China and 5G networks.

New infrastructure projects are always accompanied by conflicting visions or imaginaries and political and economic interests. We set out to study how the main British broadsheet and tabloid newspapers represented 5G deployments from January 2017 to early March 2020. *What has the media deemed worthy of coverage and which controversies did they signpost in the lead up to and during the early implementation of 5G?*

Our analysis of a newspaper sample shows that:

- Newspapers are more likely to emphasise negative aspects of 5G, using terms like "Risk" and "Threat" when reporting on the new infrastructure, less often characterising it as "Revolutionary" or "Transformational".

- Coverage of 5G deployments focuses on potential applications (such as self-driving cars, smart and home devices and the Internet of Things, or IoT), but there are very few mentions of benefits or risks to health despite the resurgence of conspiracy theories.

- References to 5G in relation to urban life generally present an optimistic view of 5G, emphasising "Efficiency" and "Innovation". Topics like "Energy Consumption", connectivity for "Inclusion" or "Exclusion", and "User Involvement in 5G Launches" are barely mentioned.

- Both the benefits and risks of 5G are under-reported by broadsheets and the tabloids.

- There is a bias towards using government and industry spokespersons as sources with very little input from academics. UK newspaper coverage of 5G does little to present a new mobile communication network in a way that would make it possible for citizens to assess its benefits and risks in an informed way.

- Technologies related to 5G deployment such as "AI and Data" are mentioned in nearly a third of the sample articles, but principally at times when Huawei's participation in the UK's 5G infrastructure has been most contentious.

- Concern about foreign government access to data is discussed, but mainly when US pressure is exerted on the UK government to exclude Huawei equipment from the 5G infrastructure. When a policy stance towards the US is reported, the predominant view is that the UK should adopt the US policy position, with many fewer articles taking the position that the UK should resist US pressure.

- Reporting on Huawei is predominantly negative or neutral, and a substantial amount of 5G news coverage does not comment on the company's participation in the UK network at all.

- When a link between Huawei and the US government or President Trump is made, this is mostly in relation to "Security" or "Trade" and "Trust" and "Privacy" are barely mentioned. The vast majority of articles do not discuss Huawei in relation to the European Union; when this link is discussed it is mainly in relation to "Trade" with "Security" a distant second. Very few articles mention "Trust" or "Privacy" in this context.

- Reporting on UK government policy in relation to 5G frequently is linked to applications such as "Surveillance", "Military Uses" or to the discussion of "Security", "Data Control", "Mobile Coverage", "Personalised Services" and "Virtualisation". The link to policy is much weaker in reporting 5G's role in public services ("Police" or "Emergency") or in "Location Tracking". UK government policy reporting is rarely linked to the benefits or risks of 5G for equipment manufacturers, to uses of "Algorithms", "AI and Machine Learning" or to social issues such as "Justice", "Fairness", "Equality", "Inequality" or "Citizen Resistance".

Our results indicate that a more comprehensive media account of 5G developments is needed if 5G's influence in urban spaces and in people's lives is to be understood. 5G is mainly reported as being poised to make urban spaces more efficient, and the media over-emphasise the profit ambitions of equipment manufacturers and mobile service operators. Reporting on external threats to the UK's security (mainly identified as Chinese) would benefit from being complemented by commentary on whether the 5G roll out in the UK is giving enough consideration to public values such as equity, inclusion, privacy and freedom of expression. It would also benefit from more systematic use of science and social science expert sources to help to counter a bias towards government and industry sources.

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Acknowledgements

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Introduction

Connectivity is an essential part of modern and urban life. Exclusion from it can make it difficult or impossible for citizens to engage in cultural, political and economic life. As the UK consumer advocacy group *Which?* puts it: "our mobile phone is central to how we live our lives".[1] This is especially so in urban places like London that typically are the first locations to see an early roll out of a new digital system. In this study, we examine how the UK broadsheet and tabloid media cover Fifth Generation mobile technology – 5G – the most recent advance in the way connectivity is provided.[2]

We investigated how the media frame this new technical system in their reporting. Journalists' decisions about what to report, and how they report it, influence how the public and industry users are encountering this new communication infrastructure and whether they welcome or resist it.[3] We focused on media coverage of urban 5G deployment in this study and principally on London. London is a global city and a centre of political power, yet it is also a place where ambitions for innovation and technology leadership come into tension with the goal of reducing inequalities in the lives of a densely organised and diverse population.

Planning for 5G has been underway for several years, with the rollout of 5G trials in the UK starting in 2019 and our sample of media coverage includes articles from January 2017 to the first week of March 2020. While we were conducting this study, Covid-19 became a major threat to public health, lockdown policies were put in place and the numbers of deaths rose. Connectivity in the UK (and elsewhere) suddenly became an even more salient feature in citizens' lives than it was before the crisis. Our data collection stopped just before the explosion of direct actions against the roll out of 5G that occurred in several countries.[4]

> ❝ Putting in tens of millions of 5G antennas without a single biological test of safety has got to be about the stupidest idea anyone has had in the history of the world. ❞
>
> **Martin L. Pall, 5G: Great risk for EU, U.S. and International Health!, 17 May 2018**

By May 2020 the dramatic expression of direct action in the UK had taken the form of attacks on more than 70 mobile network signalling towers and of countless harassments of network engineers in the streets.[5] Social media became a repository of claims about a link between 5G and Covid-19. Despite the absence of scientific evidence supporting claims about 5G harms to health,[6] pundits, celebrities and anti-5G opinion leaders sought to draw a causal link between the deployment of 5G equipment and the Covid-19 pandemic.[7]

> 66 So; the clapping is actually something that the government has setup to cover the construction work that is being done to set the 5G network. Every week, they need to test it which lets off a really loud buzzing noise for exactly 1 minute, but the clapping covers it. The initial set of 5G is actually causing corona virus. Please share this and stop clapping every Thursday. 99
>
> **That'sNonsense.com, 3 April 2020**

Investigative reports have shown how anti-5G expression builds upon a base of populism and concerned citizen groups and activists who lobby against the use of Electro-Magnetic Frequencies (EMF), a phenomenon dating back to protests against mobile and electronic equipment in the 1990s.[8] The recent spate of violence against the mobile infrastructure (ironically, often wrongly assumed to be 5G, when it is actually 4G) was substantial enough to prompt government reactions. Ofcom warned UK broadcasters in April 2020 against disseminating 5G-coronavirus theories.[9] European Commission President, Ursula von der Leyen, urged social media companies to do more to stop the spread of coronavirus-related misinformation online and Facebook and YouTube pledged to remove content falsely linking 5G to the coronavirus.[10]

This report presents a content analysis of UK media coverage of 5G just before the eruption of these conspiracy theories. Our analysis of news reporting demonstrates that the media generally do not provide insights that give citizens a heightened awareness of mobile technologies, networks and services and how they are being integrated into their lives. More comprehensive coverage would enable the public to evaluate the accuracy of 5G conspiracy claims more easily and to acquire a better understanding of the benefits and risks of a 5G infrastructure in their lives.

> 66 *The media generally do not provide insights that inform citizens about how mobile technologies, networks and services are being integrated into people's lives.* 99

Research Context

Each new mobile communication infrastructure involves new standards that enable hardware and software to provide connectivity and services. This process typically starts with a "vision" that involves multiple stakeholders, including corporate and government actors and often, though less directly, representatives of civil society. A characteristic example is the global "5G Vision" published by the International Telecommunication Union in 2015. This set out how 5G is expected to "bring new unique network and service capabilities".[11] At that time, projected global revenues by 2025 were USD 250bn with North America, the Asia-Pacific and Western Europe as the largest markets.

New generations of communication technology are accompanied by heightened expectations about their benefits for users. 5G is no exception, and investment in the UK is expected to boost the digital economy's growth. In 2016 the National Infrastructure Commission reported that London ranked 16th out of 20 UK cities for its 4G coverage and download speeds indicating the paradox of a global city falling behind in delivering an advanced communication infrastructure. Ofcom data showed that 4G was effectively reaching only 43 per cent of the UK population.[12]

4G had not bridged gaps in connectivity as expected during its roll out and there are high expectations about the potential of 5G to do so. 5G network specifications are expected to deliver connectivity in urban, and then in rural, areas, boosting inclusion and access to high quality connectivity. As then Chancellor Philip Hammond said, the move to 5G will make the UK a world leader, opening up "an interconnected world of driverless cars, smart home appliances, armies of delivery drones and lightning-fast video on the go".[13] Mobile operating companies in the UK have demonstrated their enthusiasm for the 5G vision by investing some £1.4bn for access to the radio spectrum needed to provide the new services.[14]

> ❝ *5G suppliers offer a rosy picture of substantial 5G benefits.* ❞

The industry players involved in 5G deployment, such as internet service providers and equipment manufacturers, offer a rosy picture of substantial 5G benefits. These benefits are echoed in press coverage with *The Daily Telegraph* reporting 5G as being essential for prosperity[15] and the *Daily Mirror* promoting 5G as "providing streaming in high resolution with no buffering, supporting Augmented Reality, and getting a signal at a festival or a busy station – and ditching landlines".[16] The industry view of 5G has been characterised as "the realization of a datafied dreamworld",[17] with 5G supporting a truly "smart city" and a new range of technologies (cloud based social media content delivery, virtual reality services, population sensors and time sensitive services for remote surgery and smart factories). All these are forecast to generate multiple new revenue sources for mobile network operators and for "vertical" industry sectors, such as health and transport.[18]

The UK government's ambition is for British industry to be a world leader in 5G. Ofcom has observed that "users will ultimately choose which applications and services are widely used".[19] If users are to "choose" they must have information available to them to make reasoned choices about whether to shift from 4G to 5G mobile service. The idea that citizens have the capacity to critically assess the benefits and risks associated with 5G is problematic if they do not have access to relevant information. Industry and government accounts of 5G do little to weigh the potential risks associated with the new 5G standard in relation to issues such as citizen privacy and many citizens are unlikely to turn to them for information. This means that media reporting on 5G is likely to be the citizen's primary source of information.

Analysts of the risks associated with relentless commercial "datafication" and expanding opportunities for surveillance and for limiting freedom of expression that are supported by digital infrastructures such as 5G stress that practices of large scale and continuous data extraction have been honed over the past two decades. There has been little transparency and insufficient accountability to the public.[20] By providing a distributed, virtualised network, the 5G system's configuration is designed to intensify the use of artificial intelligence-driven algorithms and machine learning, with and without human supervision. This is seen as leading to biases and power asymmetries in the way society is governed and ordered. The data processing capabilities of 5G mobile networks are associated with more extensive data capture by private companies and, in our case, with an augmented 5G infrastructure of "surveillance capitalism".[21]

In the light of both promotional and critical perspectives on 5G and its potential impacts, what aspects of 5G command media attention? What imaginaries of a digital future and smart cities does the reporting on 5G convey to readers?
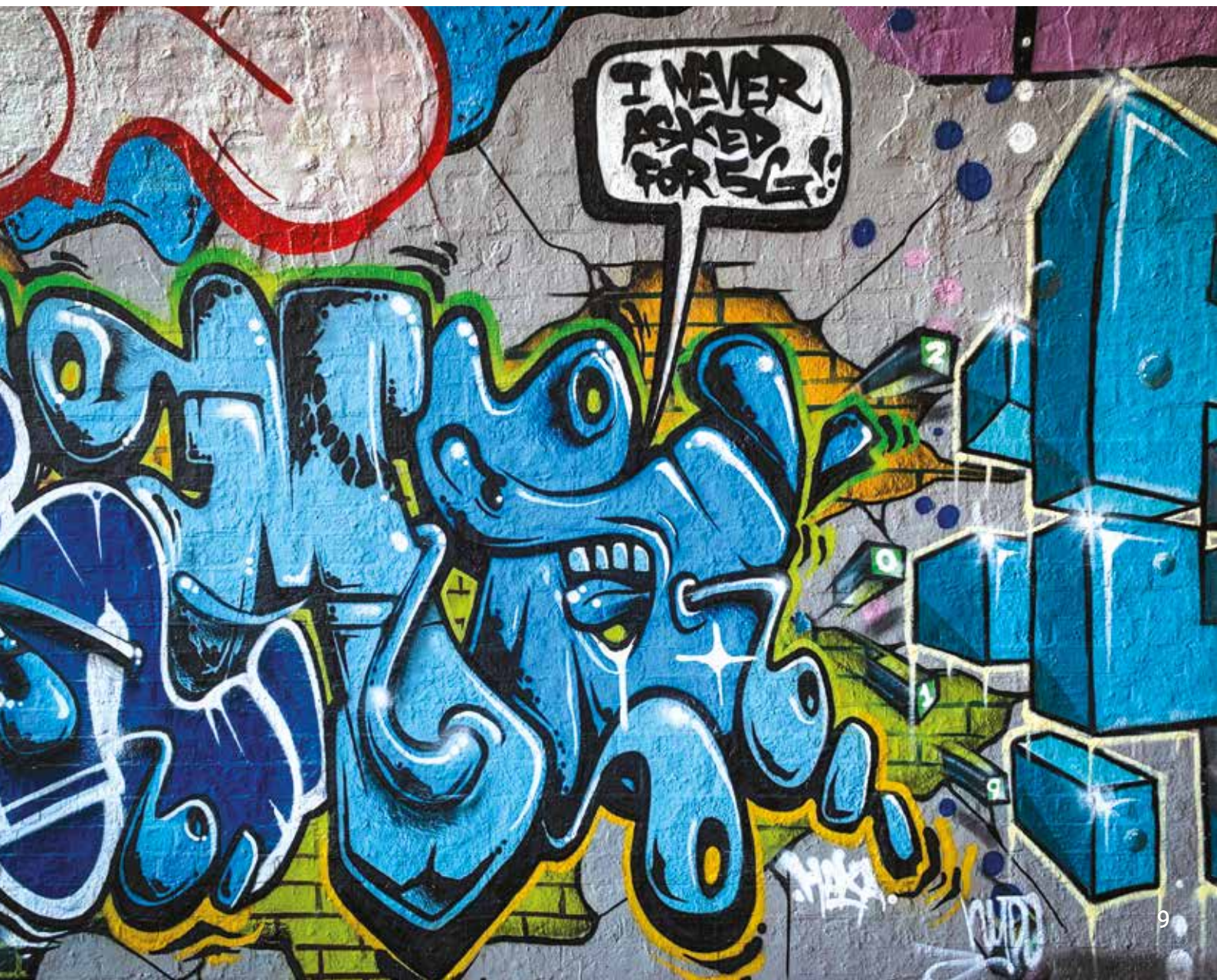
Media 5G Representation

Research Design

We set out to study how the UK broadsheet and tabloid newspapers represent 5G deployments. *What has the media deemed worthy of coverage and which controversies did they signpost in the lead up to and during the early implementation of 5G?* Our sample time frame was 1 January 2017 to 7 March 2020, resulting in 795 newspaper articles where the keywords "5G" and "London" appear anywhere in an article. We selected nine newspapers: five broadsheets (*The Daily Telegraph*, *The Financial Times*, *The Guardian*, *The Independent* and *The Times*) and four tabloids (*Daily Mail*, *Daily Express*, *Daily Mirror*, and *The Sun*).[22] In our analysis, we were as interested in examining what the media report as in what the media omit.

Overview of 5G Media Coverage

A first look at the 5G media coverage in our sample shows an overall rise in press interest across all outlets over time (see Figure 1). Mid-2019 saw an increase in the number of articles, followed by a second peak at the beginning of 2020. The first increase is around the time of the first announcements of 5G trials and the UK government's deliberations on which companies should be permitted to build out the new network. The second peak coincides with visits by US representatives to the UK to discuss 5G-related data security concerns and the role of Huawei in providing equipment for the 5G network.
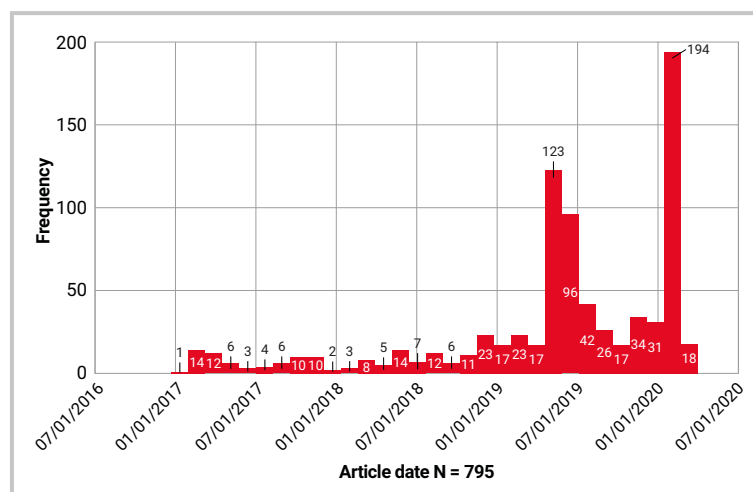

Figure 1: Frequency of articles mentioning 5G or London from January 2017 to March 2020

THE **Media** SLAMMED
OVER 5G COVID-19
CONSPIRACY COMMENTS

As shown in Figure 2, broadsheets were considerably more likely to cover 5G issues than the tabloids. Articles from the *Daily Express* and the *Daily Mirror* represent only 3 and 2 per cent, respectively, of the total of 795 articles, while *The Guardian* and *The Financial Times* are responsible for 19 and 16 per cent, respectively.
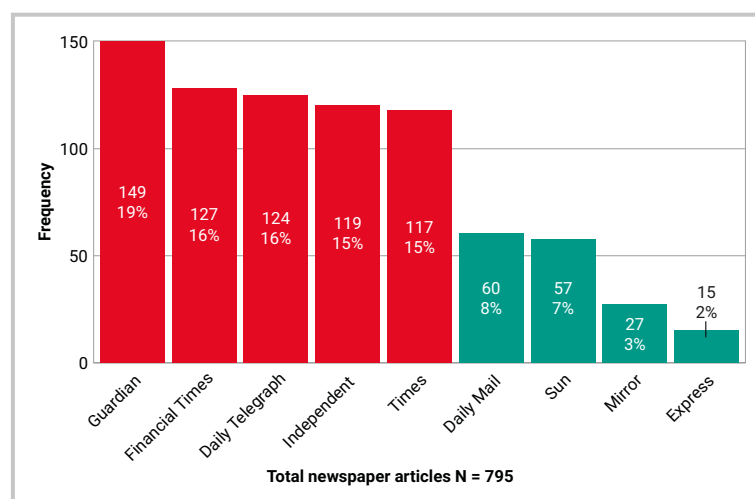
Figure 2: Percentage of mentions in UK broadsheets and tabloids

How was 5G described? The full sample of 795 articles was coded for use of descriptive terms such as "Exciting" (2%) or "Visionary" (2%) (see Figure 3). Of the 227 descriptive mentions, 50 per cent referred to 5G as a "Risk", 21 per cent referred to it as a "Threat", with 9 per cent describing it as "Revolutionary" and 7 per cent as "Transformational".

> ❝ *5G reporting typically emphasises risks and threats linked to its deployment.* ❞

This greater emphasis on risk and threat as compared with other terms may reflect frequent references in industry reports to disruptive innovative technologies – although the term "Disruptive", itself, did not figure in much of the reporting, and appeared only in 3 per cent of the total uses of the descriptive terms in our codebook.
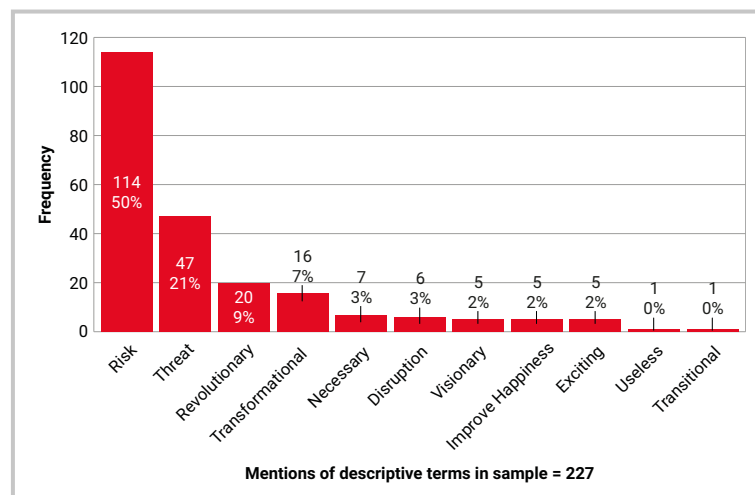

Figure 3: Number and percentage of mentions of 5G descriptors

Which 5G applications were profiled? Some 26 per cent (205) of 795 articles referred to specific applications (see Figure 4). Given the marked emphasis in the 5G vision on ultrafast broadband, it is unsurprising that service speed, self-driving cars, smart devices and home devices or IoT were mentioned to a greater extent than the other applications shown in Figure 4. The surprise was the small number of health applications mentions (13, or 4% of 205 articles), for example, telemedicine.

As indicated above, health concerns have been linked to 5G and the use of EMF. Although we did not code for this or for Covid-19, we might have expected more mentions of related items in our codebook. We coded for whether health mentions would be associated with risks that have been associated with 5G – "Microwave Exposure", "Radiation", "Cancer", or "All of These", finding that only 3 articles mentioned any health concern, with 1 mention of cancer. The articles in our sample emphasised topical applications but gave very little attention to 5G-related health concerns.

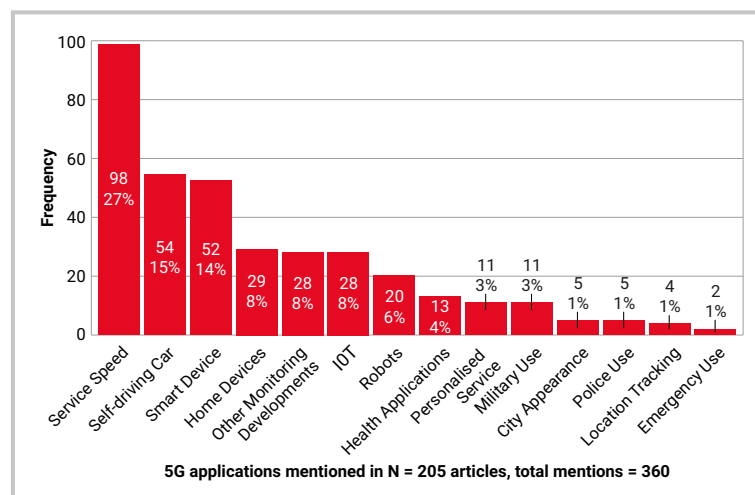*The imaginary of 5G is techno-optimistic and industry-led.*

Figure 4: Number and percentage of mentions of 5G applications

5G and Urban Life

What aspects of urban life were reported in relation to 5G? Mentions of features of urban life occurred in 157 articles (20%) as shown in Figure 5.
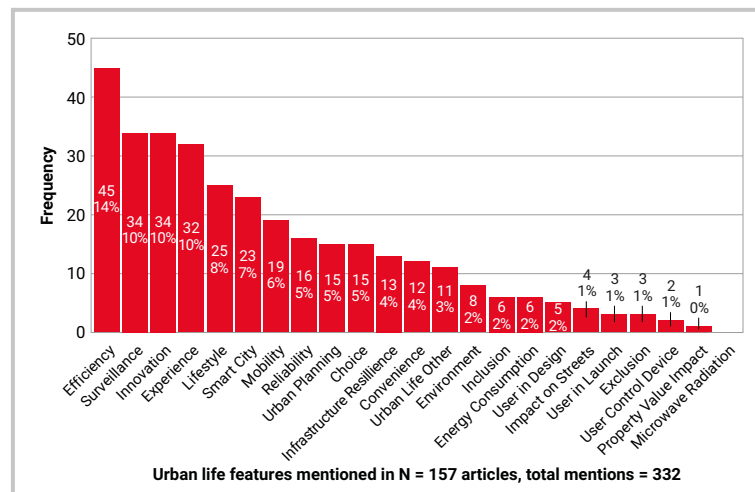
Figure 5: Number and percentage of mentions of aspects of urban life

Aspects of urban life that received the most attention in the sample seemed to mimic a techno-optimistic and industry-led view or imaginary of 5G. Media coverage emphasised potential impacts on "Efficiency" (14%) and "Innovation" (10%) with "Surveillance" and "Experience" receiving 10 per cent of mentions each. Interestingly, features of 5G that might be associated with urban experience were barely mentioned at all – "Energy Consumption", "Inclusion" or "Exclusion" from connectivity, "Infrastructural Resilience", "Involvement of Users in 5G Launches", "User Control of Their 5G Devices", and "Microwave Radiation".

Benefits and Risks Associated with 5G

Research has shown the important role that the media play in framing debates around risks related to communication technologies, for instance, potential harms associated with EMF.[23] How were the benefits and risks for different types of 5G users reported?

The benefits of 5G were under-reported in the overall sample. As shown in Figure 6, only 24 per cent (194) of 795 articles discussed the potential benefits of 5G for specific stakeholder groups of users that might be expected to have an interest. Of those mentioning these groups of users, the "Public", "Citizens", "Mobile Company" and "Large Company" were most frequently mentioned with a greater emphasis on the first two. The 636 broadsheet articles in the sample had 146 (23%) mentions of benefits and tabloids had 48 (30%, total 159) mentions. There was no difference between broadsheets and tabloids in the ordering of reported benefits.
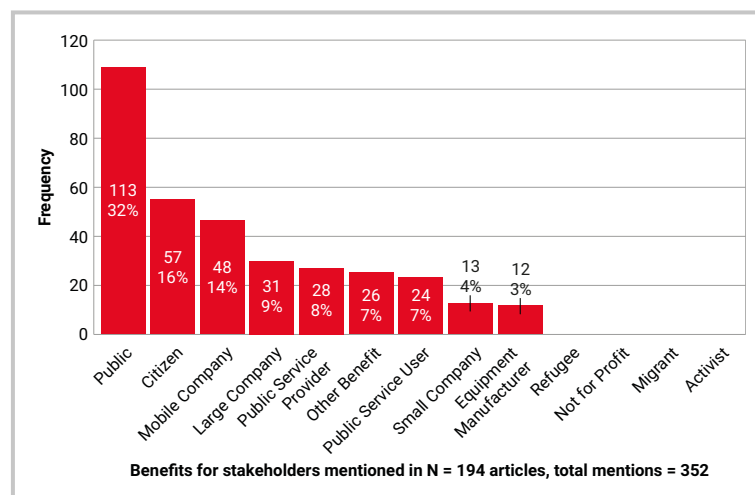

Figure 6: Number and percentage of mentions of benefits associated with 5G

Risks associated with 5G were mentioned in 35 per cent of the 795 articles, as shown in Figure 7. Of those reporting risks, these were predominantly associated with risks for "Public Service Providers", "Public Service Users", the "Public" and "Citizens". Here, 5G appeared to be more closely linked to the public than it was to companies. This was surprising because companies are generally expected to experience investment risks and new challenges of data control and management with the arrival of 5G. There was little difference between the broadsheets and the tabloids in whether they mentioned 5G risks and no difference in the ordering of risks.
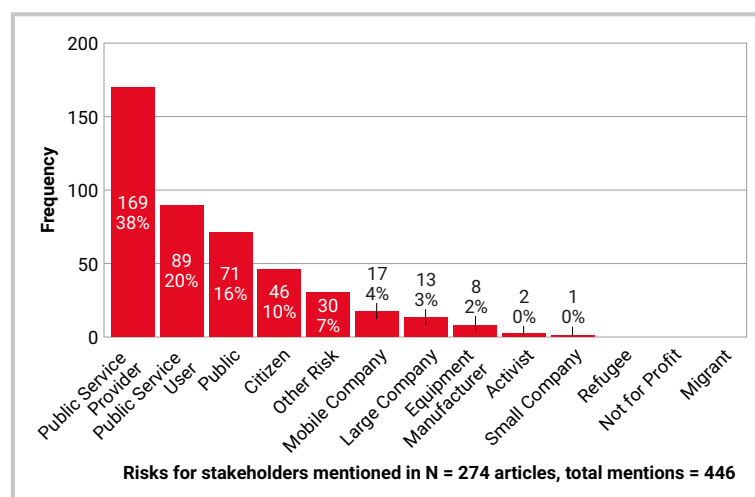
Figure 7: Number and percentage of mentions of risks associated with 5G

We might expect the media to provide information that would help readers to grasp the complex implications – benefits and risks – of 5G in their everyday lives, but the media do not appear to play this social role. Current reporting of benefits and risks does not address many of the specific impacts of 5G that are claimed in the trade and academic literature. It offers the public very little insight into what they might experience when 5G becomes available.

> 66 *The media do not provide information to help readers grasp the benefits and risks of 5G in their everyday lives.* 99

Media Focus on Technology

In contrast to the relatively low number of benefit and risk mentions associated with 5G, there were many mentions of 5G-related technology, with these appearing in 477 of the articles (60%). These were mostly generic, referring to "Networks" or "Fibre or Broadband" at 27 and 11 per cent, respectively, of total mentions (see Figure 8). Even though the UK government is hopeful that the deployment of 5G will address the still limited geographical coverage of 4G, "Mobile Coverage" and "4G" each received only 9 per cent of mentions. Other terms such as "Edge Computing" or "Virtualisation" and "Software" – technologies that are closely associated with managing and controlling mobile user data – received barely a mention in our coding for technology. There was somewhat more attention (8% of mentions) to "Hardware".

> 66 *When the media focus on 5G technology, there is little reference to culture or politics.* 99

When 5G technology was reported as a generic category or using a descriptive term that we did not code for, this was as likely to be in relation to 5G benefits as it was to the 5G risks, both of which were very likely to be mentioned in connection to technology.[24] This seems to confirm that when the focus in media reporting is on technology itself, it is characterised by little reference to culture or politics.
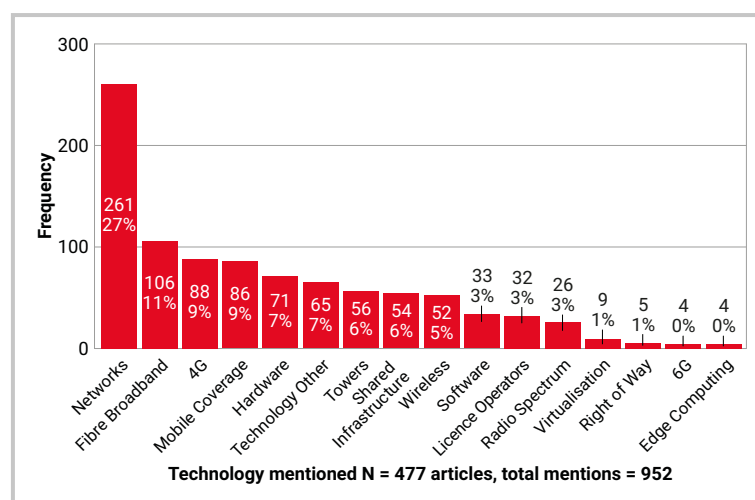

Figure 8: Number and percentage of mentions of 5G technology

Media Sources Biased Towards Government and Industry

The media often turn to expert sources to convey an understanding of new technologies, especially when discussing potential risks.[25] Articles in this study extensively cited government and industry sources, barely mentioning academic or civil society sources. Across the 795 articles, specific sources were mentioned in 73 per cent (698) of the articles (see Figure 9). There were 915 mentions of sources (698 by type and 217 by political party).

> 66 *The media cite government and industry sources extensively, but barely mention academic or civil society sources.* 99

Looking only at the types of sources, 55 per cent of mentions were government, 36 per cent were industry, and only 5 per cent of these types of sources were academic or civil society. Of the 217 articles that mentioned a government source, 78 per cent of these were affiliated with the Conservative Party, 13 per cent with Labour, and 4 per cent or less for each of the other political parties.
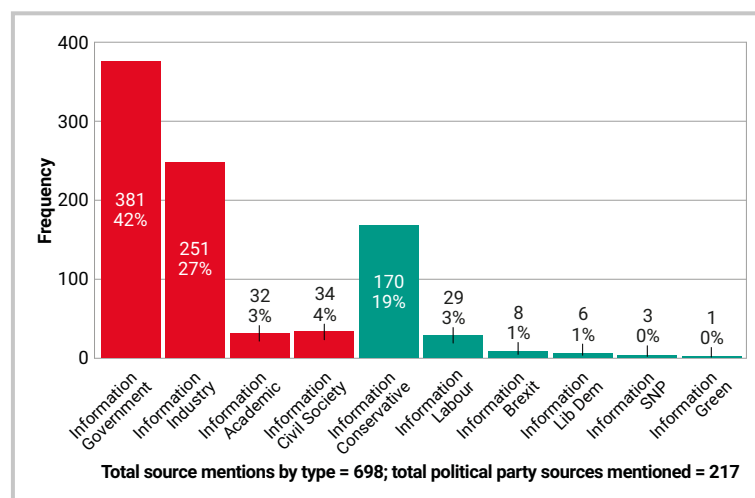
Figure 9: Number and percentage of overall sources by type and by political affiliation

The fact that government and industry sources received the most mentions is unsurprising since they are key actors in the early roll out phase of 5G deployments (eg, influencing which manufacturers for 5G equipment). Notable, however, is the very low number of academic sources – 3 per cent of any source mentioned and 5 per cent of the types of sources.

This result is consistent with research indicating a lack of citations to research in discussions about EMF.[26] In our sample, the media turn only very occasionally to science or social science expertise when reporting on how a new communication technology is being embedded in society. The very few articles mentioning a civil society source indicates that citizens' voices are rarely reported regardless of whether they support or are against 5G deployment. By providing little detailed information about 5G and how it is being received by citizens, this media coverage is unlikely to provide a robust basis for public understanding of 5G. It cannot be of much help in countering negative and misinformed views, such as those that were mobilised and erupted just after our sample time frame.

5G and Geopolitical Tensions

During former Prime Minister May's tenure the US government started to pressure its "Five Eyes" partners to ban the participation of Chinese companies in the development of the mobile communication infrastructure. It sought a complete ban on Huawei's participation. In May 2019 US Secretary of State, Mike Pompeo, said that any move to open up the 5G network to Huawei would let China "control the internet of the future", dividing "Western alliances through bits and bytes".[27]

There were differing views in the UK among government and security experts about whether Huawei's participation posed a security threat. Mrs. May's decision not to ban Huawei was reported in the *The Sun* as "May has sold out to China" and the paper went further to argue she should be removed from office.[28] By this time, major UK mobile operating companies were already using Huawei's equipment. US pressure continued into 2020. In March 2020, the White House issued a "National Strategy to Secure 5G" highlighting the priority for 5G to be deployed to protect the national security interests of the United States.[29]
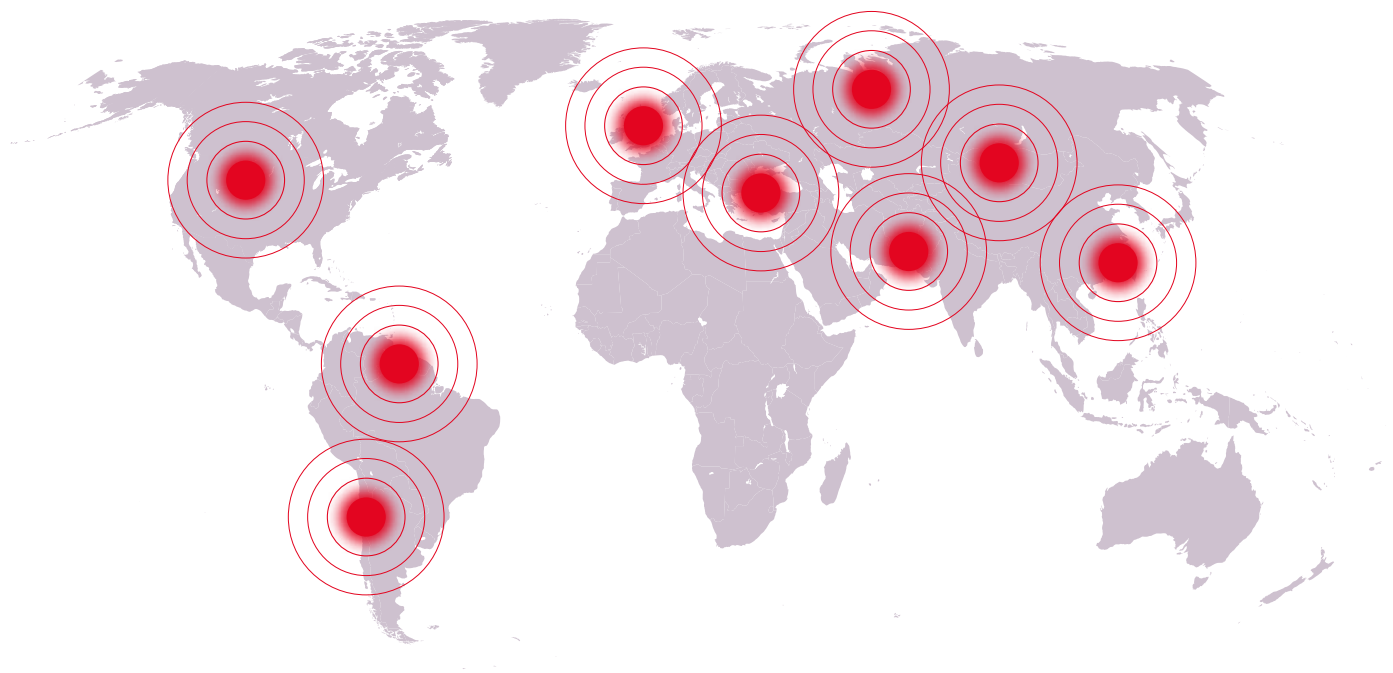
The US sought to link a UK decision on Huawei's involvement in its 5G infrastructure to a future US-UK trade deal and threatened to limit the UK's access to security intelligence if a ban was not put in place. Prime Minister Johnson announced that Huawei would be permitted to provide non-core equipment in the UK network (with a cap up to 35%). The *Daily Mail* reported that President Trump viewed this as a "betrayal". Former Conservative Cabinet Minister, David Davis, described the decision as "the worst since MI6's recruitment of Kim Philby".[30] *The Financial Times* also portrayed the decision in a negative light, "not because it drew the ire of Donald Trump's US administration, but because it traded future security for short-term political and economic gains".[31] *The Sun* published a negative comment from one of its readers to the effect that with Huawei equipment in place, "it may only take one phone call from Russian ally Putin to the Chinese premier to sabotage our internet. Why risk it?"[32] A later promise by the UK government that Huawei's equipment would be phased out failed to quell reporting of extreme risk: this is "like using a Nazi firm to develop Britain's radar system in 1939", attributed to Sir Iain Duncan Smith.[33] Just before this report was published, the Government ordered a complete phasing out of Huawei's equipment over the coming seven years.

A selective reading of press coverage does not give a systematic view of the geopolitical tensions that influence 5G deployment in the UK. We wanted to examine systematically how the British newspapers cover the geopolitical aspects of 5G. Our analysis of press coverage of the race to roll out 5G focused on Huawei and the UK government's reaction to the aggressive position of the US government towards Huawei as a Chinese company.

5G and the Competitive Race for Leadership

Across the 795 sample articles, there were 114 (14% of total) mentions of any kind of competitive race, although these increased in 2020 when the discussion of Huawei's participation in the UK's 5G network heated up (see Figure 10).
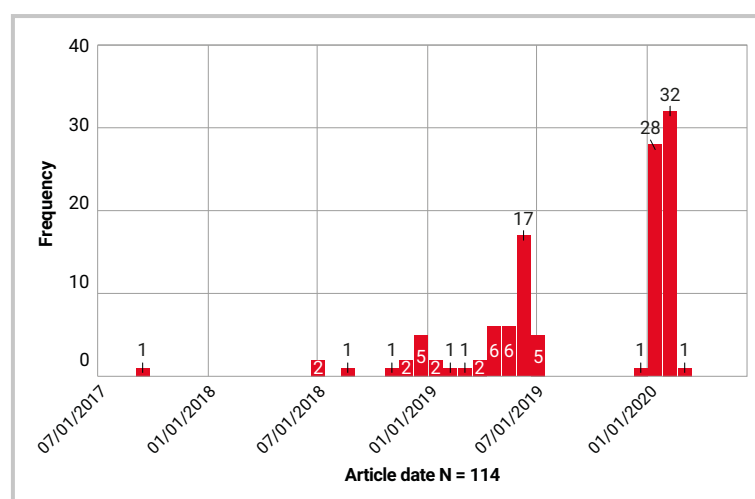

Figure 10: Number of mentions of a 5G race or competition

Being a highly decentralised or "virtualised" network architecture compared to 4G, 5G provides a basis for extending the use of artificial intelligence (AI) and machine learning (ML) to process vast quantities of data generated by multiple uses of the 5G network. Mentions of "AI and Data" were present in 31 per cent or 244 of the articles. As shown in Figure 11, however, mentions of "AI and Data" in the press predominantly occurred when geopolitical pressures and concerns about Huawei's participation were most contentious. Reporting on the growing use of AI and data enabled by 5G networks and the way this raises new challenges for data protection and security was not evident in our sample. This was surprising given the attention to these issues in 5G vision documents and in documentation on 5G standardisation activities in the planning period.

> ❝ *AI and data issues are reported mainly when Huawei's role in the 5G network is most contentious.* ❞
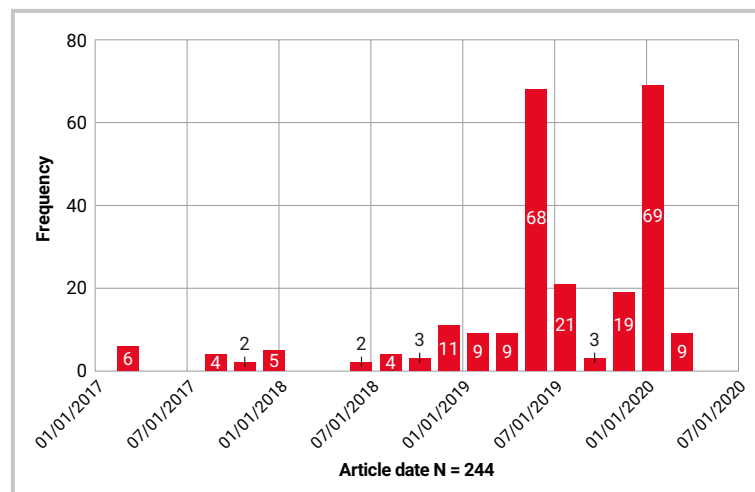
Figure 11: Number of mentions of AI or data from January 2017 to March 2020

When newspapers discuss the relation between 5G and Data or AI, it is mostly to emphasise issues of security or foreign interference. Figure 12 shows that these mentions occurred in 244 (31% of articles) and were principally associated with "Security" (25%), "Foreign Government Data Access" (21%) and "Foreign Company Data Access" (14%). Issues associated with "State Access to Data" in general, "Other Illegitimate Actor Access to Data" (eg, black hat hackers, terrorists, perpetrators of cybercrime or terrorists), as well as "Data Ownership", "Inequality", or "Citizen Resistance", had exceedingly few mentions.

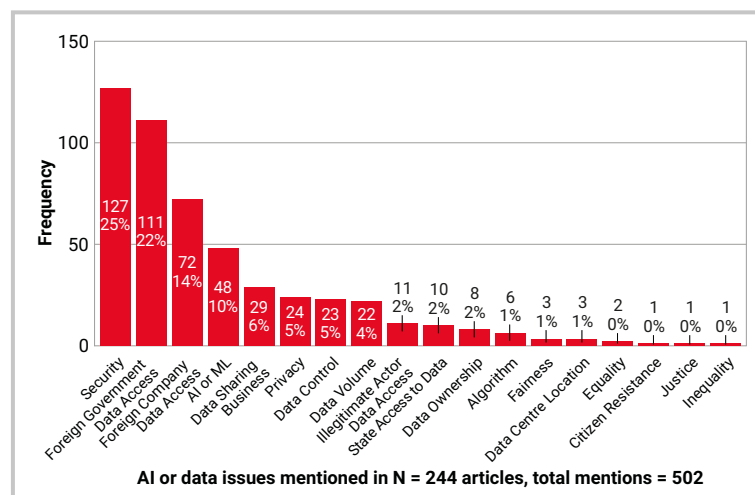**Figure 12: Number and percentage of issues mentioned in relation to AI or data**

As shown in Figure 13, mentions of "Foreign Government Access to Data" peaked in both the 2019 and 2020 periods when US pressure was being exerted on the UK government, with 111 mentions in total, but were otherwise relatively absent. "Foreign Company Access to Data" received only 72 mentions across the sample and these peaked only in 2020. Any "State's Access to Data" was mentioned only 10 times across the sample.
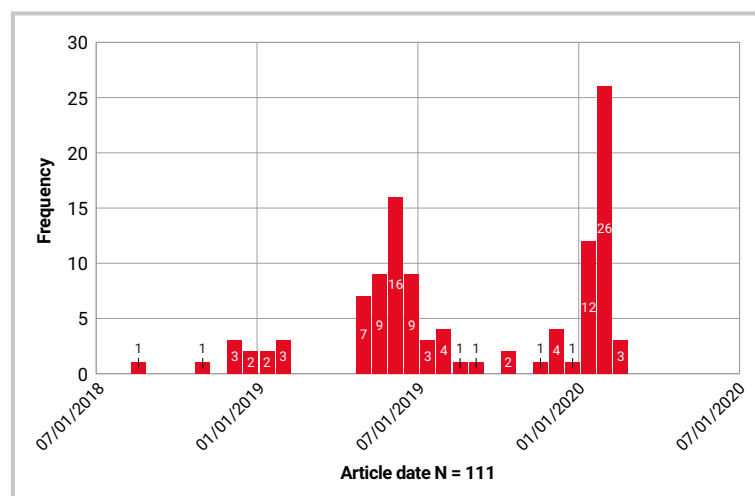
Figure 13: Number of mentions of foreign government access to data from January 2017 to March 2020

The media coverage of 5G in our sample mainly concentrated on geopolitical US-UK controversy; much less so on whether 5G deployment might result in enhanced access by the UK government (or, indeed, any other state) to citizens' data. Such access was much less apparent in the media's framing of 5G-related security issues. There was a fairly a strong likelihood of mentions of "Network" technology and "Data Control" together with "State Access to Data", "Foreign Company Access to Data" and "Foreign Government Access to Data". This association did not hold, however, for mentions of "Illegitimate Actor Access to Data".[34] These results suggest an over-emphasis on technology, itself, as the reason for security concerns.

This approach to reporting also neglects the political and economic incentives that are driving geopolitical manoeuvring using 5G as a focus for strengthening national trade and competitive positions. It helps to fuel an impression that technology is the source of ideological conflicts as anti-China sentiment ramps up around a new "cold war".

> 66 *Media focus on US-UK controversy, but not much on whether 5G enables UK or other foreign government access to data.* 99

Media Focus on China and Huawei

In the light of the political pressure on the UK applied by the US concerning Huawei's participation in the UK's 5G network, we expected the press to focus on this company. Some 63 per cent or 498 of 795 articles referred in some way to the company.[35] In these articles where Huawei was named and a view of the company was reported, the view was predominantly negative (47%) or neutral (48%), with 5 per cent indicating a positive view (see Figure 14).

> 66 *The media treat Huawei equipment in the 5G network as a problem with very few mentions of a positive role.* 99

This suggests a strong media inclination to treat the presence of the company's equipment in the 5G infrastructure as a problem. There was no strong relationship, however, between the likelihood of mentioning Huawei and of mentioning a competition between companies or countries or a global race to establish 5G leadership.[36]

What was the view of Huawei when it was mentioned?
- Positive
- Negative
- Neutral

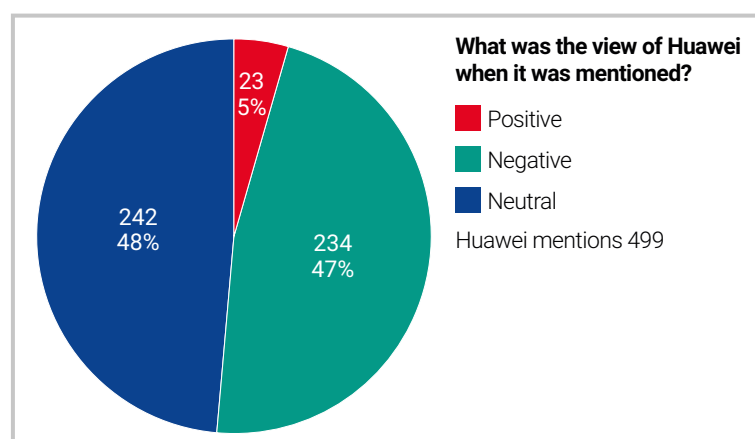Huawei mentions 499

23 5%
242 48%
234 47%

Figure 14: Number and percentage of mentions of Huawei as positive, negative or neutral

Huawei received slightly less attention proportionately in the tabloids than in the broadsheets, and broadsheets characterised the company in a negative way more frequently than in the tabloids. When Huawei was mentioned in the broadsheets, this was very likely to be in association with mentions of "Risk", "Threat" and "Surveillance".[37] In the broadsheet sample, there was also a strong likelihood of Huawei mentions with mentions of features of urban life. This relationship held for aspects of urban experience such as "Lifestyle", "Smart Cities" and "Urban Experience", as well as "Convenience", "Inclusion" and environment-related items in the codebook. However, the likelihood of mentions of Huawei and items such as "Choice", "Exclusion", "Infrastructure Resilience" or "User Control" of their 5G devices was very small.[38]

Media Bias Towards Covering US Policy on 5G

In view of the geopolitical controversy around the participation of Huawei in 5G network construction in the UK, we examined how often the press linked Huawei to the US policy position.

As shown in Figure 15, Huawei was linked to President Trump's or the US government's policy position by the media 424 times (53 per cent of the articles). This peaked during the periods of overt US pressure on the UK government.
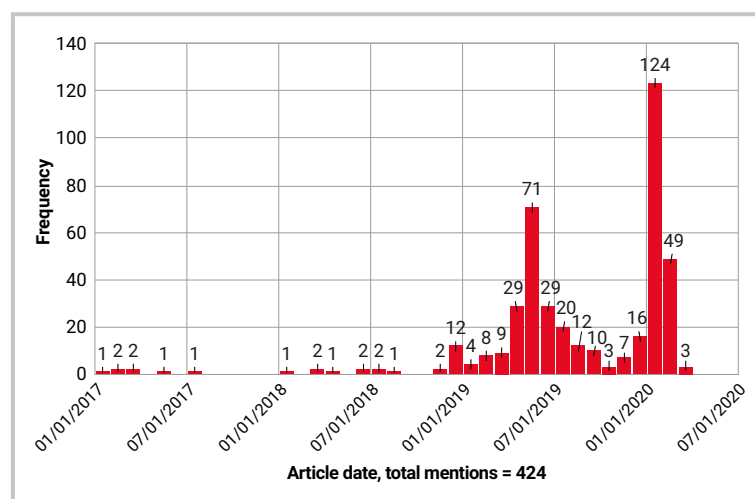

Figure 15: Number of mentions of Huawei in association with

Trump or US policy from January 2017 to March 2020

When the Huawei-US link was made, as shown in Figure 16, this was mainly in relation to "Security" (28%) or "Trade" (16%), considering mentions in all the sample articles, while "Trust" and "Privacy" were barely mentioned. Excluding "No Mention" and "None of These", for the remaining 386 links, "Security" accounted for 58 per cent, "Trade" for 32 per cent, "Trust" for 8 per cent and "Privacy" for 2 per cent.
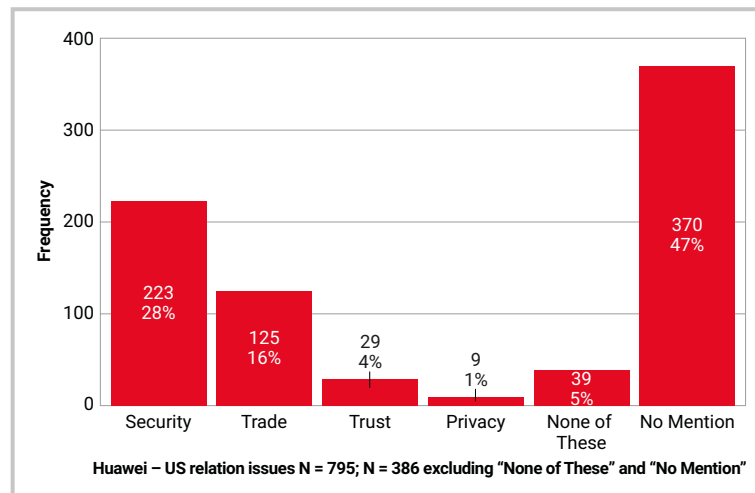

Figure 16: Number and percentage of mentions of issues in relation to Huawei and Trump or US government

By contrast, in our sample 76 per cent of the articles made no mention of Huawei in relation to issues relating to the European Commission or the European Union, and issues of "Security", "Trust" or "Privacy" were rarely mentioned (see Figure 17). Again, excluding "No Mention" and "None of These", the 115 articles that referred to these issues gave greatest emphasis to "Trade" (73%), with "Security" having only 17 per cent of mentions, "Trust", 8 per cent and "Privacy" 2 per cent.

> 66 *Most discussion of Huawei and 5G focused on security or trade with little discussion of trust or privacy issues.* 99

Huawei – EU relation issues N = 795; N = 115 excluding "None of These" and "No Mention"
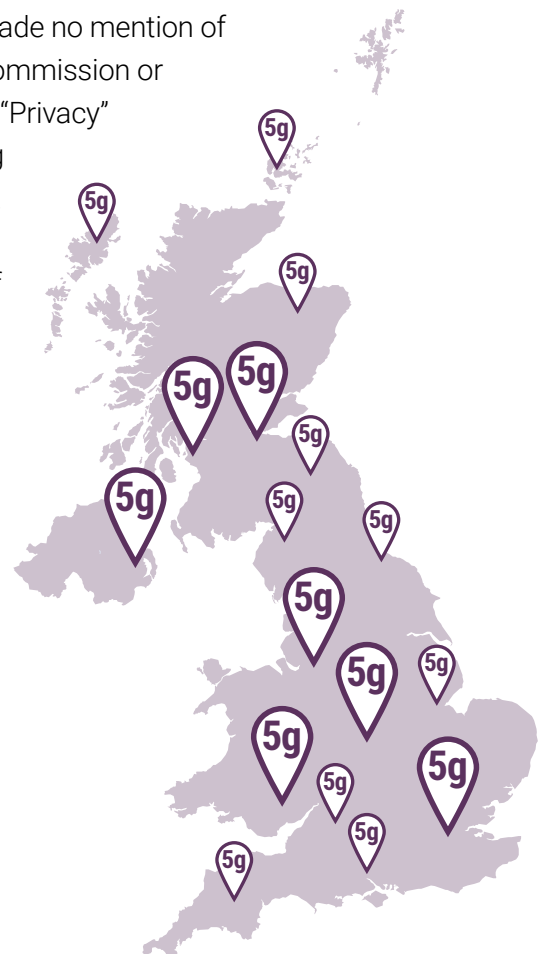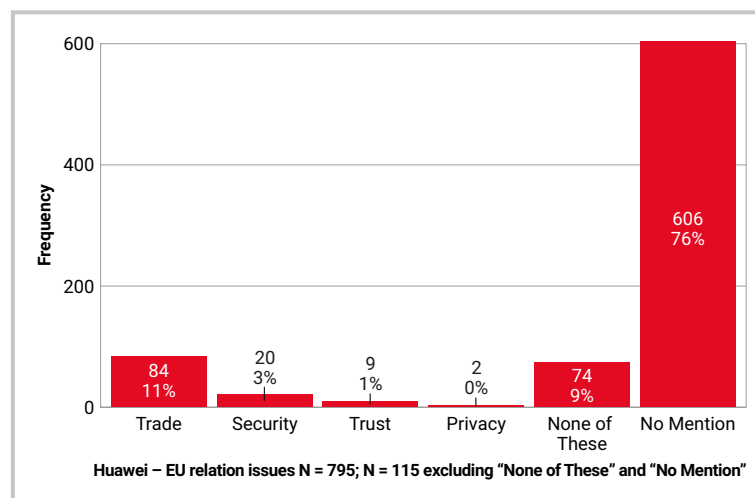
Figure 17: Number and percentage of mentions of issues in relation to Huawei and Europe

As indicated in Figure 18, when mentions of Huawei occurred in relation to the UK's policy stance toward the company (495 mentions), this relationship was mainly reported as being unclear (57%), but 27 per cent of reported views indicated that the UK should adopt the US policy position, with 16 per cent indicating that the UK should resist the US policy position (300 articles made no mention of any policy view). This result is not surprising, given that the issue of Huawei's participation in the UK's 5G network was contested throughout the period of this study.

> ❝ *The main view in the press was that the UK should adopt US policy on Huawei's role in 5G.* ❞

Overall, the likelihood that the UK government's policy would be mentioned in relation to Huawei was strong in our sample.[39] Excluding the "Unclear" view and focusing on the 214 "Adopt" or "Resist" mentions, the predominant view was that the UK should adopt the US policy position (63%). Once again, there was very little difference between the broadsheets and the tabloids.
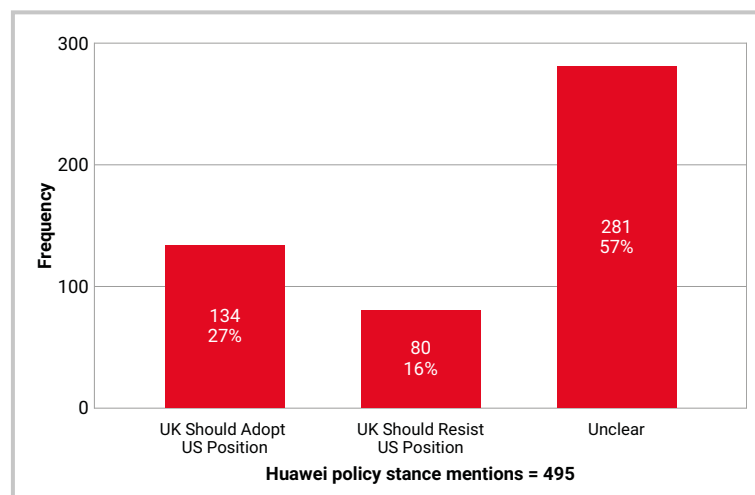
Figure 18: Number and percentage of articles with a view on Huawei and UK policy

5G was associated with policy or regulatory challenges in 36 per cent (282) of articles. When challenges were reported, this was disproportionately in reference to the "UK (Central) Government Policy" (91%), and far less often in reference to "Local Government" (4%) or policies in relation to "Citizens or Consumers" (5%) (see Figure 19). This suggests that media reporting conveys an overly centralised vision of the role of policy in the deployment of 5G despite the fact that this network configuration has consequences for life in urban places at the local level.

> 66 *5G and policy or regulatory challenges were reported as UK central government issues, rarely as local government or citizen or consumer policy issues.* 99

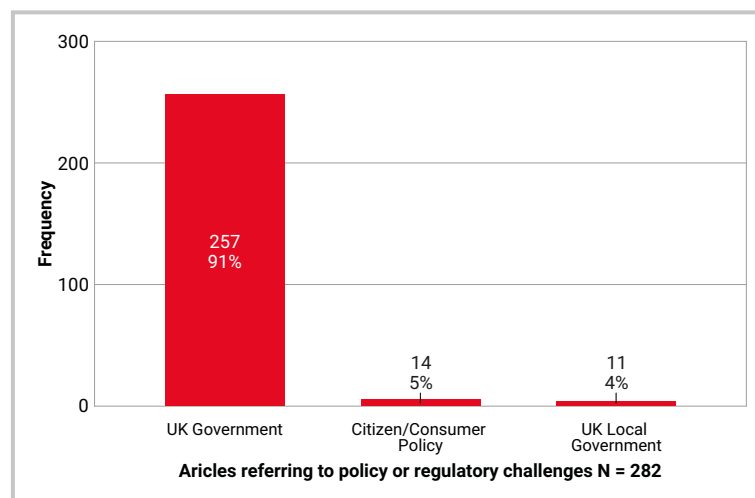Figure 19: Number and percentage of mentions of UK policy or regulatory challenges in relation to central or local government and citizens/consumers

The likelihood of mentions of UK government policy challenges and mentions of "AI and Data" and "Risks to Public Service Providers" was relatively high across the whole sample.[40] Similarly, mentions of UK government policy tended to be related to mentions of 5G uses for "Surveillance", "Military Uses", "Security", "Data Control", "Personalised Services" and "Virtualisation" as well as "Mobile Coverage", but far less so for "Police Use" and "Emergency Use" of 5G or for "Location Tracking".[41] There was also very little likelihood that UK government policy would be mentioned in relation to what we might expect to be signposted alongside innovations in 5G such as the uses of "Algorithms" or "AI and Machine Learning" as well as the role of "Hardware", "Software", "Towers and Masts", or "Broadband". In addition, issues of "Justice", "Fairness", "Equality" or "Inequality" and "Citizen Resistance" to the new network were also very rarely linked to government policy in the media coverage.[42]

In addition to providing a skewed representation of issues around the presence or absence of a Chinese company – Huawei – in the UK mobile communication infrastructure, the media reporting in our sample disproportionately covers UK central government policy and regulatory issues. It neglects local government and the citizen and consumer voices and interests in 5G deployment, yet they benefit from and bear the risks of 5G as the new infrastructure is embedded in urban spaces. The media, based on our analysis, tend to focus 5G issues and concerns on one large and high-profile company – Huawei – and on the UK central government's position with respect to US security, and to a lesser extent, trade.[43]

Conclusion

The media are influential in the way the public comes to understand how communication networks affect their lives. The media's framing power has been especially evident in recent (and earlier) claims about the impact of mobile networks, services and handsets on public health due to perceptions of EMF.[44] Prior to the eruption of conspiracy theories in relation to Covid-19, this analysis of press coverage shows that the media have done little to provide comprehensive insight for citizen readers about the arrival and implementation of a new 5G network. They have not done so in a way that is likely to be responsive to citizen concerns. Issues such as trust and privacy were barely mentioned. This suggests that very little, if any, attention is being paid to the potential role of the 5G network in amplifying commercial datafication practices and privacy infringements or in changing the way citizens communicate in urban spaces.

> 66 *The press covers security and data control issues but not in a way that is likely to inform citizens about the potential risks of 5G.* 99

Press coverage mostly echoes government and corporate stakeholder claims and counterclaims about the UK's progress in implementing 5G. Progress is related to external security threats more than it is to the fortunes of government and corporate actors that seek to remove Huawei from its technology leadership position. While there is some coverage of security and data control issues that may inform citizens about some of the potential risks of 5G, the media reporting does not convey an understanding of the whole architecture of the 5G system and its consequences for the infrastructural environment. These consequences are not limited to whether a foreign company is likely to spy at its government's behest on UK citizens.

The results of our content analysis suggest an urgent need for the UK media to reframe discussion of 5G through a broader and more critical assessment of claims about its benefits and risks. If a stronger basis for public understanding of 5G and related infrastructure developments is to be encouraged, the media coverage will need to change.

We recommend that:

- Journalists should reach out to sources of academic expertise (both technical and non-technical) in addition to those they commonly use. This would not necessarily avert the propagation of 5G conspiracy theories. However, attacks on mobile telecommunication equipment fed by conspiracy theories linking 5G to Covid-19 are more likely to gain momentum when the media omit or downplay key issues and insights from existing scholarship.

- The motivations and incentives of stakeholders who make security and trade claims relating to the 5G infrastructure need investigative media coverage that explains the rationales underlying contested stakeholder positions.

- Instead of focusing principally on external threats to security (mainly identified as Chinese), links need to be established between changes in the 5G infrastructure and changes in citizens' control over their data and new opportunities for surveillance by any private or state actor. Greater prominence must be given to issues of data and privacy protection. This could be achieved by turning to citizens' voices and local city government as sources.

- The motivations of government and corporate stakeholders that are promoting 5G to achieve inclusive connectivity and improve the experience of urban life need to be covered in relation not only to efficiency and innovation, but also, and crucially, in relation to the impact of a new connectivity infrastructure. Understanding of tensions between commercial and public values requires reporting on whether commercial profit is being prioritised over public values (privacy, freedom of expression) in the design and implementation of 5G. This would support a better informed public debate about how 5G infrastructure should be regulated.

More prominence needs to be given in media coverage to citizens' voices and local city government concerns.

The media coverage examined in this report results in a void within which 5G/Covid-19 conspiracy theories can thrive. The information resources in the media are not consistent with enabling citizens to assess 5G and other digital infrastructure developments in relation to their urban lives. The public understanding of 5G is not the sole responsibility of the media. Many factors shape the public's ability to relate changes in the digital infrastructure to their lives. However, our analysis surfaces biases in the UK media's coverage of 5G and points to a systematic neglect of issues that warrant a more informed public debate.

5G media coverage results in a void in which 5G/Covid-19 conspiracy theories can thrive.

Our study is time limited, covers only nine UK newspapers (not social media), and the structured codebook may mean that we missed some aspects of media coverage that are present in the media. Reporting on issues that our study indicates are neglected would support a more open assessment of 5G-related security risks, threats and harms to citizens. It would also help to foster a 5G infrastructure that is less likely to ramp up the commercial exploitation of citizens' data. The new infrastructure must be compatible with citizens' preferences for how they communicate in their urban lives and it must secure their privacy and safety. This requires a deeper understanding of 5G issues and is unlikely when reporting focuses on outcomes of a highly centralised politics and enables a conspiracy-driven environment to flourish.
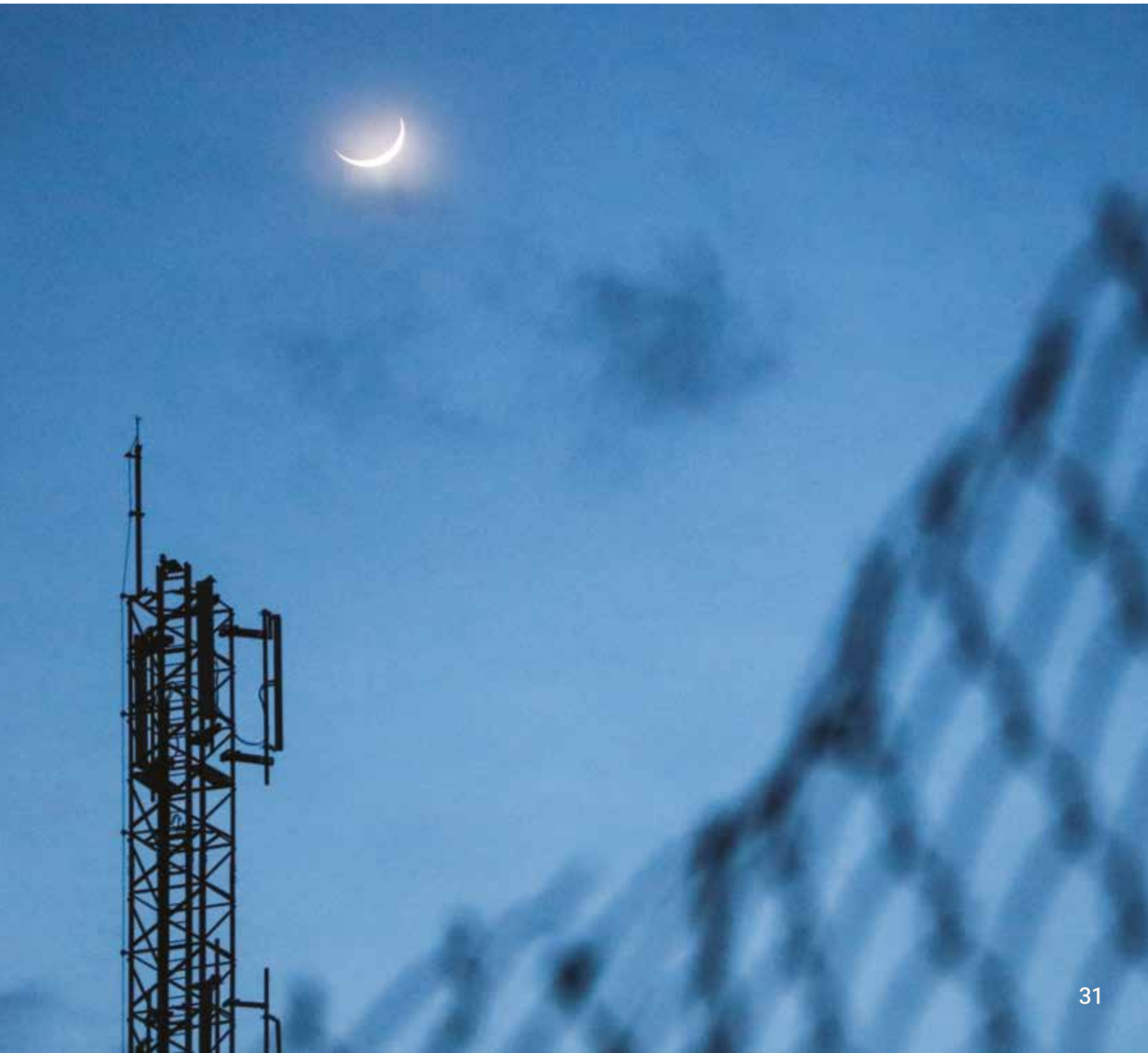
Notes and References

1   Sweney, M. (2017) "4G mobile: UK urban areas with best and worst coverage revealed; London ranks 16th out of 20 big cities and towns, with coverage and download speeds varying widely, says Which?", *__The Guardian__*, 3 May.

2   5G mobile services are described as "a set of wireless software and hardware technologies that will produce a significant improvement in data speed, volume, and latency (delay in data transfer) over fourth generation (4G and 4G LTE) networks". See US Cyberspace Solarium Commission (2020) "**Cyberspace Solarium Report**", Washington, DC, March.

3   Elvers, H.-D., Jandrig, B., Grummich, K., & Tannert, C. (2009) "Mobile phones and health: Media coverage study of German newspapers on possible adverse health effects of mobile phone use", *Health, Risk & Society*, 11(2): 165–179; Hom, A. G., Plaza, R. M., & Palmén, R. (2011) "The framing of risk and implications for policy and governance: The case of EMF", *Public Understanding of Science*, 20(3): 319–333; Rowe, G., Frewer, L., & Sjöberg, L. (2000) "Newspaper reporting of hazards in the UK and Sweden", *Public Understanding of Scienc*e, 9(1): 59–78.

4   We did not code for mentions of "Coronavirus" or "Covid-19" in our sample but there were 27 mentions of the former and two of the latter.

5   Hamilton, I. (2020) "77 cell phone towers have been set on fire so far due to a weird coronavirus 5G conspiracy theory", *__Business Insider__*, 6 May.

6   The International Commission on Non-Ionizing Radiation Protection (ICNIRP) which assesses health risks due to electromagnetic field exposure (EMF) and radio broadcasts had called for new guidelines for millimetre-wave 5G, the highest frequency 5G telecoms standard and found it safe with exposure to base stations achieving around 1 per cent of the allowable maximum and about 50 per cent of the upper limit for handsets, although in daily use it is about 1 per cent. See Hern, A. (2020) "5G confirmed safe by radiation watchdog", *__The Guardian__*, 12 March. The WHO restated its finding that "no adverse health effect has been causally linked with exposure to wireless technologies" since it began studying the claims in 1996. It does not envisage consequences from 5G. See **WHO** (2020) "5G mobile networks and health", 27 February.

7   Some fact checked, eg, **POLITIFACT** (2020) "Coronavirus Hoax: Fake Virus Pandemic Fabricated to Cover-Up Global Outbreak of 5G Syndrome", *The Millennium Report*, 2 March.

8   See Shullenberger, G. (2020) "Invisible Enemies", ***Realities***, 4 May; Waterson, J. and Hern, A. (2020) "How false claims about 5G health risks spread into the mainstream, ***The Guardian***, 7 April, and Tiffany, K. (2020) "Something in the air", ***The Atlantic***, 13 May.

9   Waterson, J. (2020) "UK media outlets told not to promote baseless 5G coronavirus theories", ***The Guardian***, 2 April.

10   See Quinn, B. (2020) "Facebook acts to halt far-right groups linking Covid-19 to 5G", ***The Guardian***, 12 April.

11   International Telecommunication Union (2015), "Recommendation ITU-R M.2083-0", ***IMT Vision***, September.

12   See National Infrastructure Commission (2016) ***Connected Future***, London.

13   Sweney, M. (2017) "4G mobile: UK urban areas with best and worst coverage revealed; London ranks 16th out of 20 big cities and towns, with coverage and download speeds varying widely, says Which?", ***The Guardian***, 3 May 2017.

14   EE, Vodafone, O2 and Three – reported in *The Times*, 6 April 2018, paying less than the service providers paid for 4G spectrum.

15   Evans, M. (2017) "New digital infrastructure is vital for our prosperity", *The Daily Telegraph*, 3 May.

16   The *Daily Mirror*, 7 July 2019.

17   See Mattern, S. (2019) "Networked Dream Worlds", ***Real Life,*** 8 July.

18   Lemstra, W. (2018) "Leadership with 5G in Europe: Two contrasting images of the future, with policy and regulatory implications". *Telecommunications Policy*, 42(8): 587-611.

19   See **Ofcom** (2018) "Enabling 5G in the UK", London, 9 March.

20   See Cammaerts, B. and Mansell, R. (2020) "Digital platform policy and regulation: Toward a radical democratic turn". *International Journal of Communication*, 14: 1-19; Couldry, N. and Mejias, U. A. (2019) *The costs of connection: How data is colonizing human life and appropriating it for capitalism*. Stanford, CA: Stanford University Press, and van Dijck, J., Poell, T., and De Waal, M. (2018) *The platform society: Public values in a connective world.* Oxford: Oxford University Press.

21   See Couldry, N. and Mejias, U. A. (2019) *The costs of connection: How data is colonizing human life and appropriating it for capitalism.* Stanford, CA: Stanford University Press, and Zuboff, S. (2019) *The age of surveillance capitalism: The fight for a human future at the new frontier of power*. New York: Public Affairs.

22 Nexis/Lexis was used to search the selected papers from 1 January 2017 to 7 March 2020 using the search terms "5G" and "London". Articles referring to 5 grams were removed. There was a very small number of duplications where the same article was published on different days. News articles accounted for 76 per cent of the 795 articles in the sample, followed by OpEds (13%), with letters to the editor, other or unclear article types accounting for the remaining articles. Batches of around 35 articles per coder were coded by 22 MSc students. They received training on the codebook and a pilot coding of five randomly selected articles was done by all coders. An aggregate intercoder reliability check (IRC) was calculated for each item in the codebook. For those below IRC=78 per cent, the questions were rephrased and the layout of the codebook was enhanced to make it easier to code the 157 main and sub-items. The codebook questions asked for "yes/no" answers on most items and a few variables were coded with multiple options as discussed in the text. The analysis of nominal data used basic frequency counts and the chi square statistic. The codebook and data are available upon request.

23 Claassen, L., Smid, T., Woudenberg, F., & Timmermans, D. R. M. (2012) "Media coverage on electromagnetic fields and health: Content analysis of Dutch newspaper articles and websites", *Health, Risk & Society*, 14(7–8): 681–696; Mercer, D. (2002) "Scientific method discourses in the construction of 'EMF Science': Interests, resources and rhetoric in submissions to a public inquiry". *Social Studies of Science,* 32(2): 205–233; Mitchell, L. M., & Cambrosio, A. (1997) "The invisible topography of power: electromagnetic fields, bodies and the environment". *Social Studies of Science*, 27(2): 221–271.

24 $\chi 2$ significant at p <.01 in both cases. Details of significance tests are available upon request and are not reported in detail here or in notes that follow.

25 Burgess, A. (2010) "Media risk campaigning in the UK: From mobile phones to 'Baby P'", *Journal of Risk Research*, 13(1): 59–72.

26 Claassen, L., Smid, T., Woudenberg, F., & Timmermans, D. R. M. (2012) "Media coverage on electromagnetic fields and health: Content analysis of Dutch newspaper articles and websites", *Health, Risk & Society*, 14(7–8): 681–696.

27 Payne, S. (2019) "Pompeo invokes Thatcher to Urge UK to Take Hard Line on China", ***The Financial Times***, 9 May.

28 *The Sun*, "May has sold out to China", 10 May 2019.

29 See US (2020) "National Strategy to Secure 5G of the United States of America", **The White House**, Washington, DC, March. Executive Order (E.O.) 13873, issued 15 May 2019, on "Securing the Information and Communications Technology and Services Supply Chain" establishes the authority to prohibit certain transactions that involve information and communications technology or services designed, developed, manufactured, or supplied by persons owned by, controlled by, or subject to the jurisdiction or direction of a foreign adversary that pose an undue or unacceptable risk to the national security of the United States'.

30   Davis, D. (2020) "Huawei deal is most devastating security blunder since MI6 hired Philby", ***The Mail on Sunday***, 23 February.

31   Stephens, P. (2020) "Post-Brexit Britain cannot rely on a special relationship", ***The Financial Times***, 30 January.

32   *The Sun*. (2020), quoting D. Amos in "What you think" column, 26 February.

33   Sparrow, A. (2020) "Rolling Coverage", *The Guardian*, 4 March.

34   $\chi 2$ significant at p <.05.

35   We did not specifically code for coverage of other companies. Across the sample, European companies as candidates to supply equipment for the 5G infrastructure were mentioned: Ericsson 52, Nokia 56 and Alcatel 4. US companies: Cisco 7, Qualcomm 19, Altiostar 1, Airspan 1, Mavenir 1 and Parallel Wireless 1 were reported as having a stake in building out a 5G network to US specific standards. Samsung 51, Sony Mobile 0, and ZTE 18 were also mentioned.

36   $\chi 2$ not significant, p. >.05.

37   $\chi 2$ significant at p <.01.

38   $\chi 2$ significant at p <.05.

39   $\chi 2$ significant at p <.01.

40   $\chi 2$ significant at p <.01.

41   $\chi 2$ significant at p <.05.

42   $\chi 2$ not significant, p. >.05 for items including equipment manufacturers, infrastructure resilience, use of algorithms or AI and machine learning, mentions of justice, fairness, equality and inequality, citizen resistance, as well as hardware, software, towers and masts, and broadband.

43   A search of the data indicated that UK mobile companies and equipment manufacturers – American, European and Chinese received much less attention than Huawei in the media's reporting of 5G.

44   Elvers, H.-D., Jandrig, B., Grummich, K., & Tannert, C. (2009) "Mobile phones and health: Media coverage study of German newspapers on possible adverse health effects of mobile phone use". *Health, Risk & Society*, 11(2): 165–179; Hom, A. G., Plaza, R. M., & Palmén, R. (2011) "The framing of risk and implications for policy and governance: The case of EMF", *Public Understanding of Science*, 20(3): 319–333. Rowe, G., Frewer, L., & Sjöberg, L. (2000) "Newspaper reporting of hazards in the UK and Sweden", *Public Understanding of Science*, 9(1), 59–78.

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British Press Reporting
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