



Digital Infrastructure

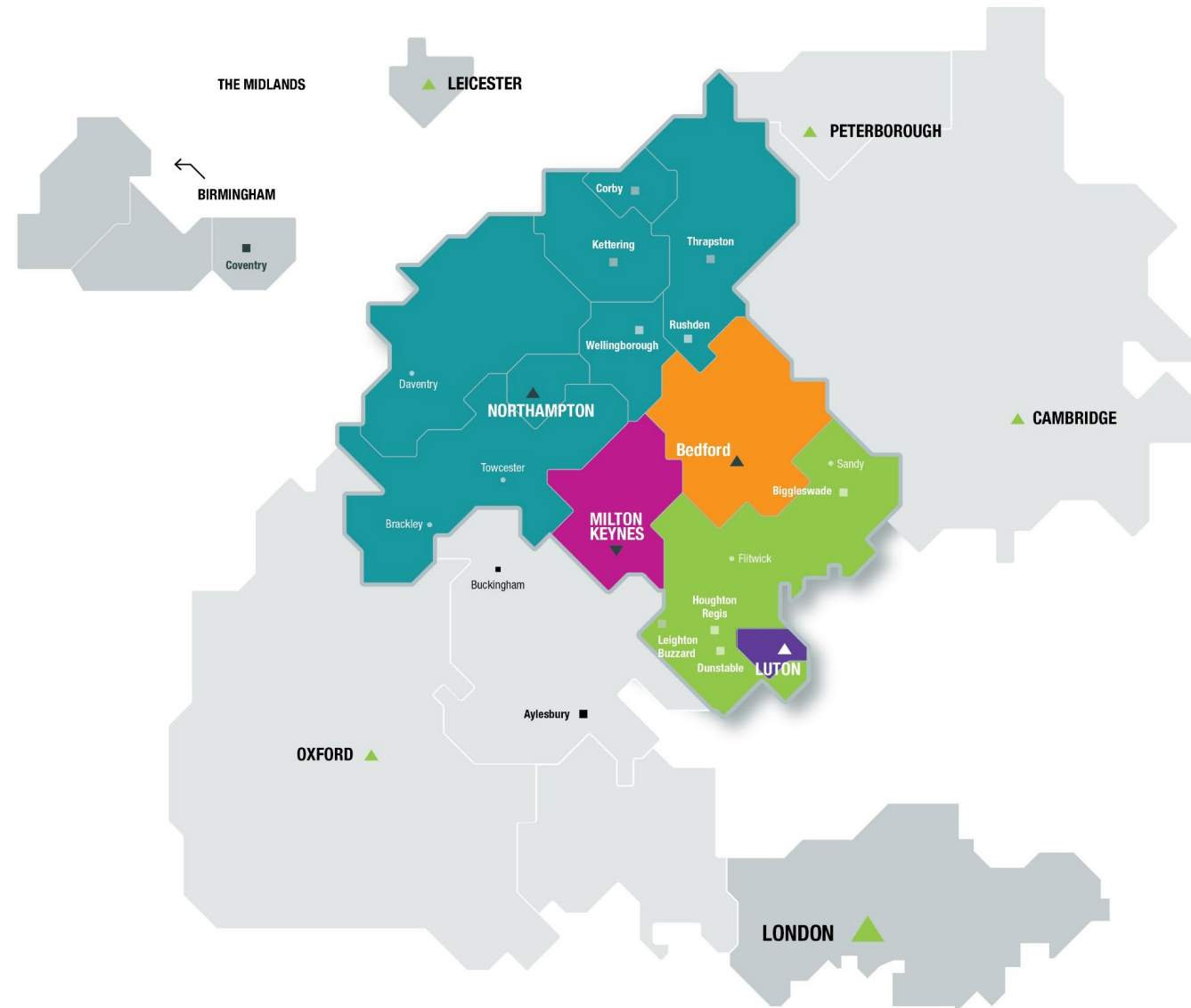
Supporting Evidence

Base

Infrastructure, skills and
access

Background

- Any underlying raw data in this document can be provided on request.
- Links have been included for interactive maps. Note that online maps are subject to change as improvements are made to the quality of the underlying data.
- Note that from 1st April 2021, the South Northamptonshire, Daventry and Northampton districts merged into the West Northamptonshire Unitary Authority. Similarly, the Corby, Kettering, Wellingborough and East Northamptonshire districts merged into the North Northamptonshire authority.

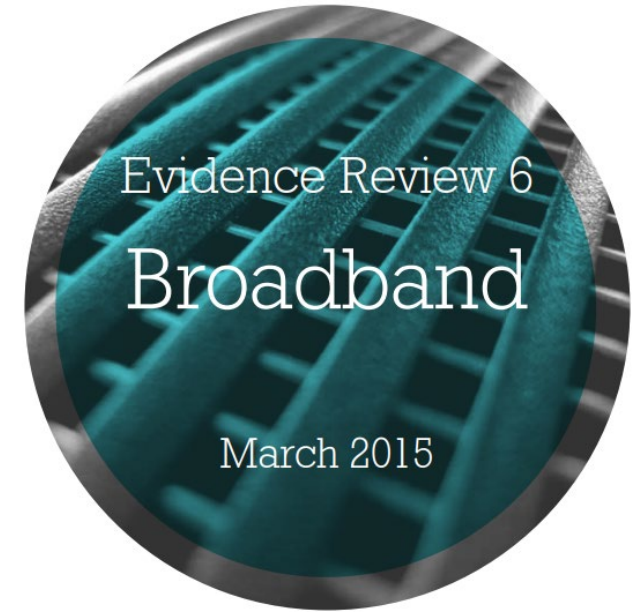




▲ Evidence of economic benefit

- Extending broadband to an area can affect firm productivity, number of businesses, and local labour market outcomes (such as employment, income and wages).
- These effects are not always positive, are not necessarily large, and may depend on complementary investments by firms (for example, training workers, or reorganizing sales strategy or supply chains to take advantage of faster internet connections).
- Effects can vary across different types of industries and workers with service industries and skilled workers possibly benefiting more than manufacturing industries and unskilled workers.
- The economic effects of broadband tend to be larger in urban areas (or close to urban areas) than in rural areas.

(Summary of digital infrastructure studies collected by the What Works Centre for Local Economic Growth)



▲ Digital infrastructure impacts: broadband

According to a study by the European Commission (i) **the BCR for 5G in the UK is estimated at 2.35 in direct output effects**, based on a 2020 optimal investment level, compared to a BCR of 2 for the rest EU28. But, these benefits are mainly as a direct result of the project.

Research by Deloitte (ii) finds a potential for a **1.4% GDP per capita uplift** in response to a doubling of data consumption per 3G connection, but only in developed economies.

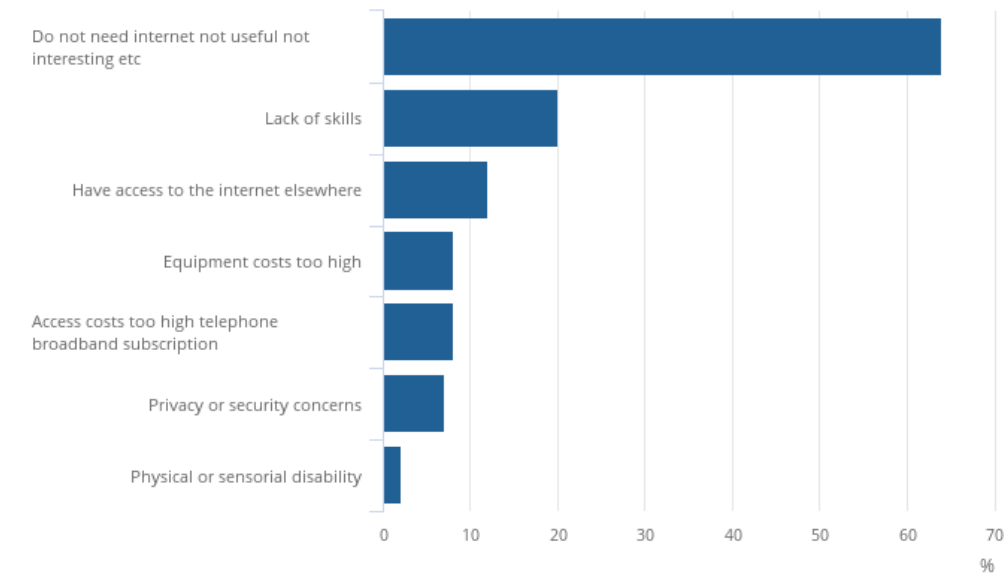
Research also suggests (iii) that the reduced latency of 5G is highly suitable for use of data while moving, as it enables devices to switch connectivity between different pieces of infrastructure more smoothly. Higher bandwidths can also enable providers to gather more information about usage, allowing for smart tariffs.

Sources

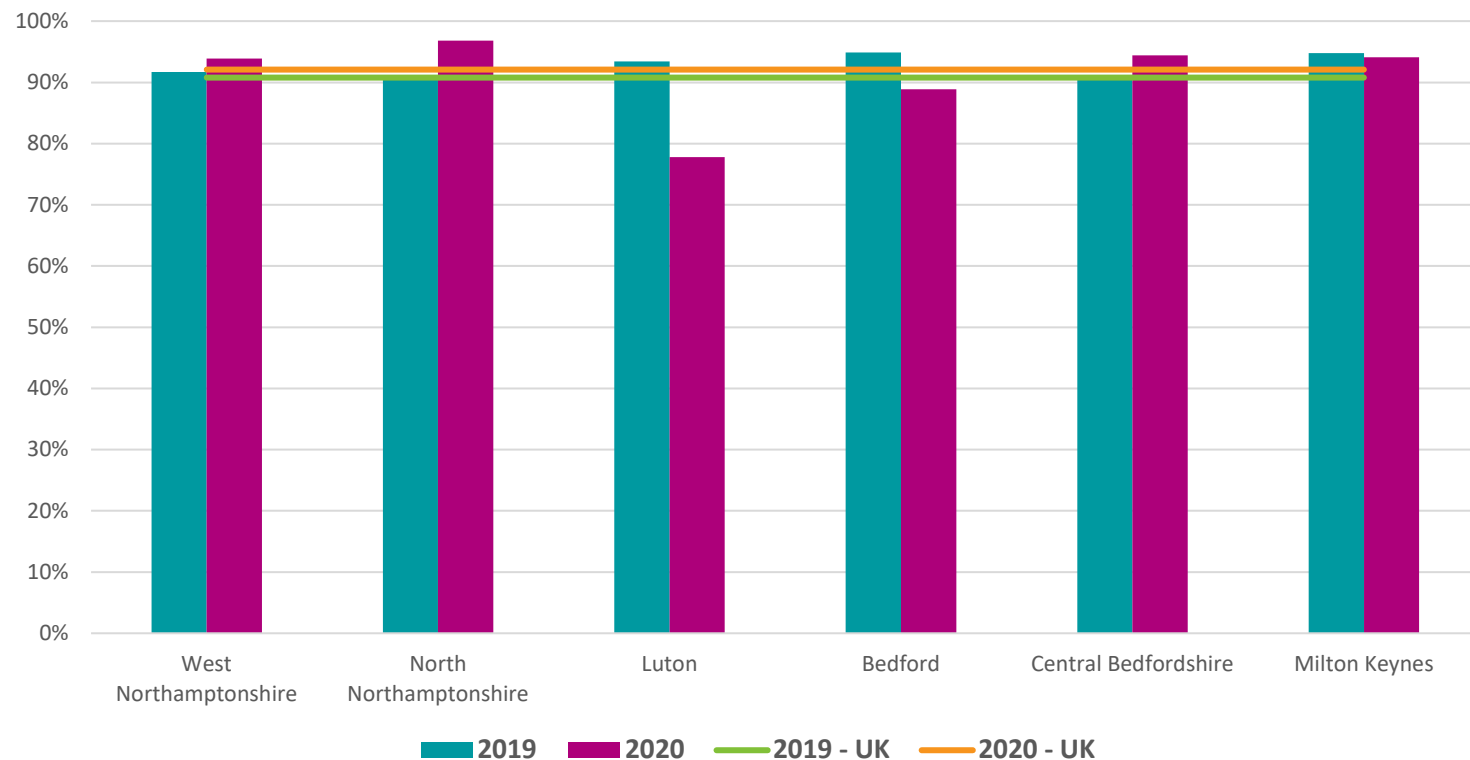
- (i) European Commission (2016), 'Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe'
<https://ec.europa.eu/digital-single-market/en/news/5g-deployment-could-bring-millions-jobsand-billions-euros-benefits-study-finds>
- (ii) Chris Williams, Davide Strusani, David Vincent, David Kovo: The Economic Impact of Next-Generation Mobile Services: How 3G Connections and the Use of Mobile Data Impact GDP Growth, from the global information technology report, pp. 77-80.
- (iii) Evolution of Mobile Wireless Communication Networks-1G to 5G as well as Future Prospective of Next Generation Communication Network:
<http://d.researchbib.com/f/annJcwp21wYzAioF9xo2AmY3OupTIIpl9OqJq1p3DIZQRmY1LIFGtIZQRmZGphpTEz.pdf>

▲ Digital infrastructure impacts: 5G

Figure 17: The most common reason for not having internet access in the household is a perceived lack of need, followed by a lack of skills
 Percentage of households by reason for not having household internet access, Great Britain, 2017



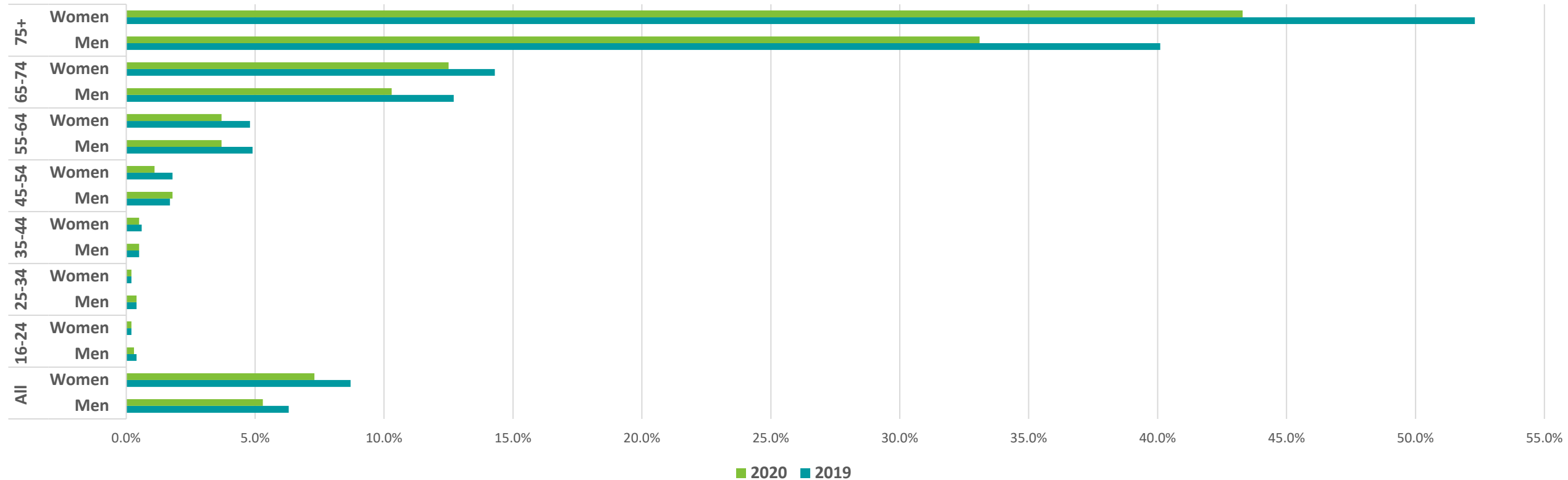
Proportion of individuals reporting having used the internet in the last three months, aged 16+, in the UK and by SEM area, 2019 and 2020



Source: [ONS – Internet Users, UK: 2020](#) (NB: survey period was in January to March in 2019 and 2020)

While the leading reason for a lack of internet access in the home is a perceived lack of need, some 8% of non-internet users in the UK could not afford a connection and/or hardware in their home. More recently, recent internet use in the SEM is generally above average, but has decreased in some areas during 2020.

Proportion of individuals reporting having never used the internet by gender and age group, UK, 2020




Source: [ONS – Internet Users, UK: 2020](#) (NB: survey period was January to March in 2019 and 2020)

Internet non-use is more common among older adults, but has significantly reduced during in 2020, although note that this was recorded prior to any lockdown restrictions in 2020. Women are also more likely to be non-users than men.

“For adults facing digital exclusion, the challenges of social distancing are many. Our research with New Horizons, a one-to-one coaching programme for people experiencing financial issues in the East of England, reveals that digital exclusion creates additional problems for people already experiencing poverty: putting together a CV, applying for jobs, managing and keeping track of money, and applying for Universal Credit are just some of the essential activities made that much harder for the digitally excluded. ...

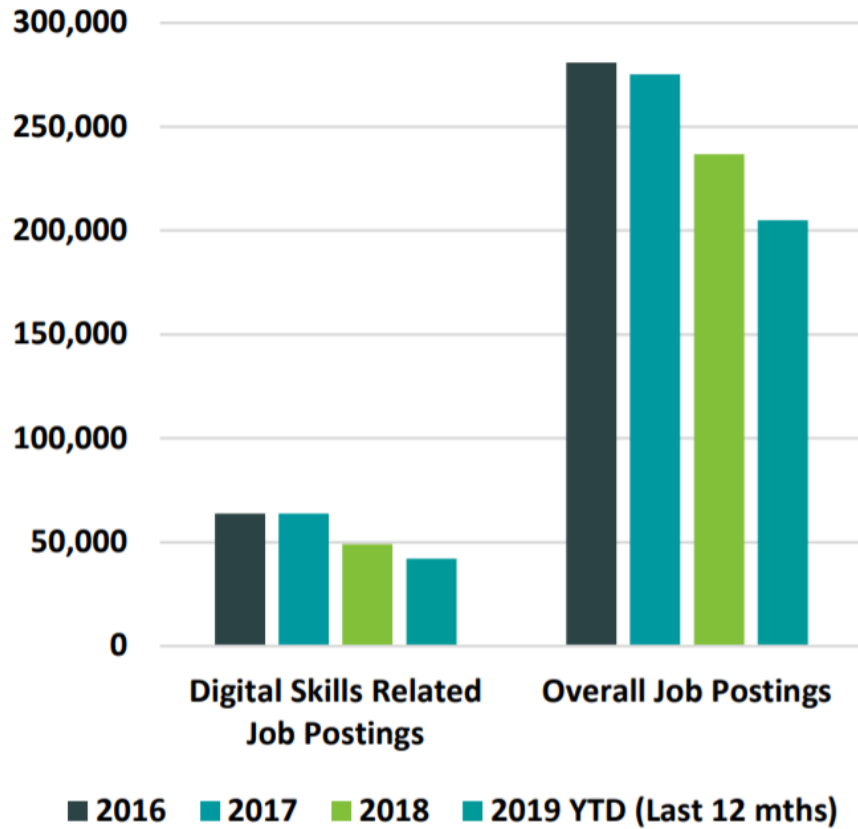
Even where a person has access to IT equipment at home, along with the necessary skills to use it, financial concerns can be prohibitive. As another New Horizons coach explained, for many digitally excluded adults, public libraries offer the opportunity to get online without placing additional strain on already stretched finances.’

Source: [Cambridge Centre for Housing and Planning Research, University of Cambridge](#)

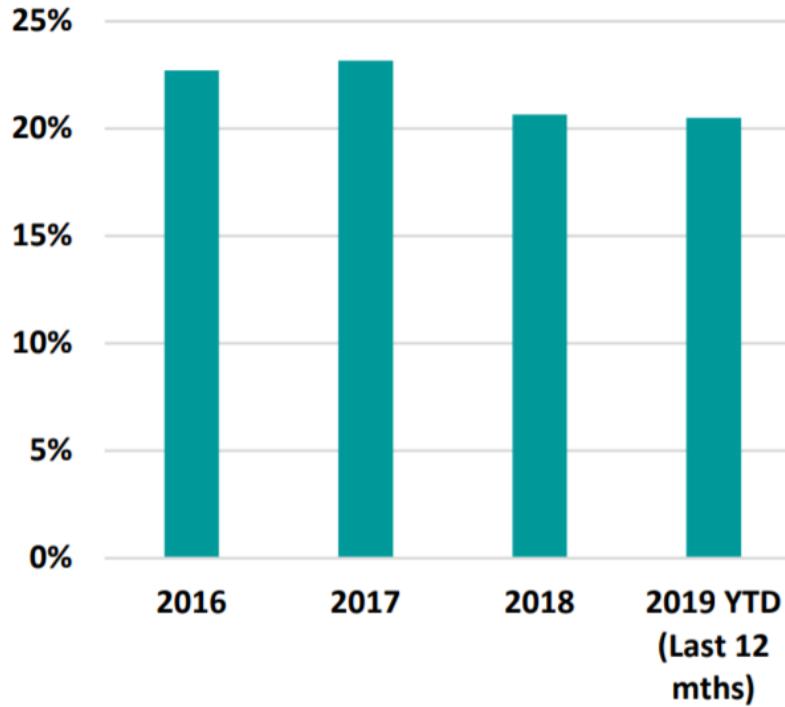


Furthermore, there is some qualitative evidence suggesting that poor access to digital services can cause poverty to worsen, limiting access to job hunting, CV writing and banking services. The impact of lockdown on library access may also limit digital access to households with stretched finances.

SEM Job Postings 2016-2019



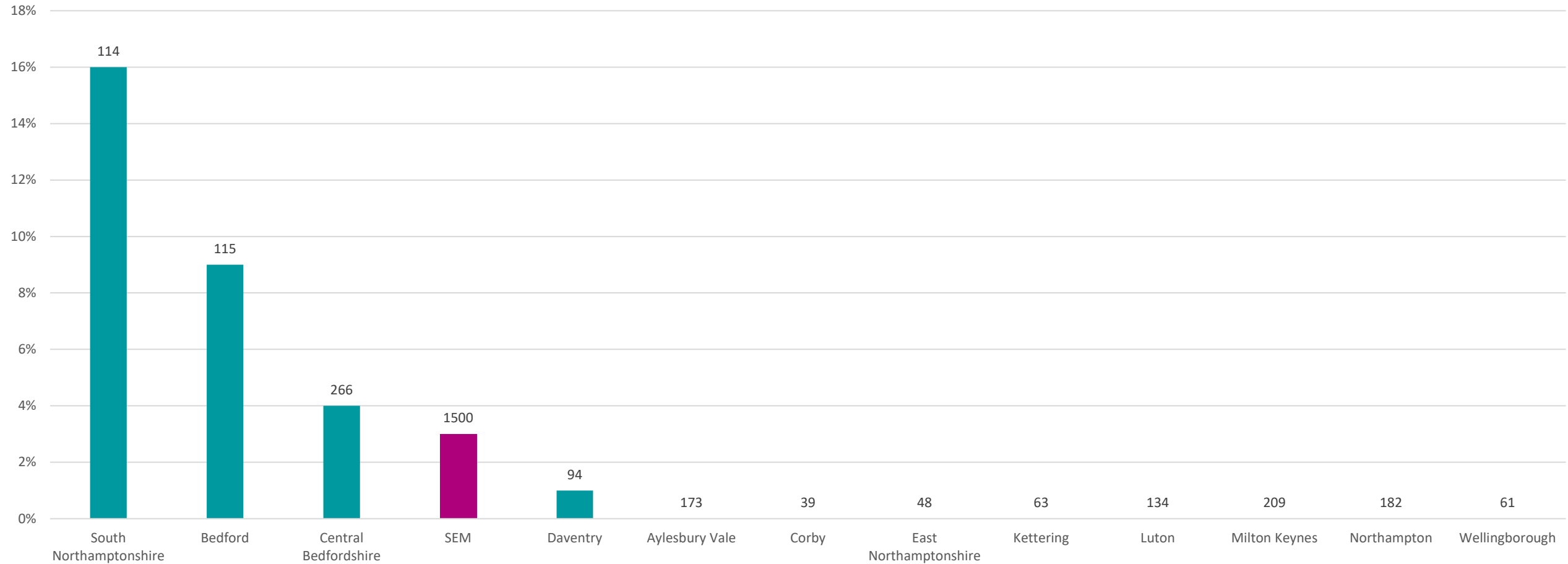
Digital Skills Related as a Percentage of Overall Job Postings



Source: [Analysis of Digital Skills in the South East Midlands December 2019, SEMLEP](#)

Furthermore, some 1 in 5 job postings in the area explicitly require digital skills

% businesses citing IT Infrastructure as a constraint on business growth (unprompted list) with sample sizes (2019)

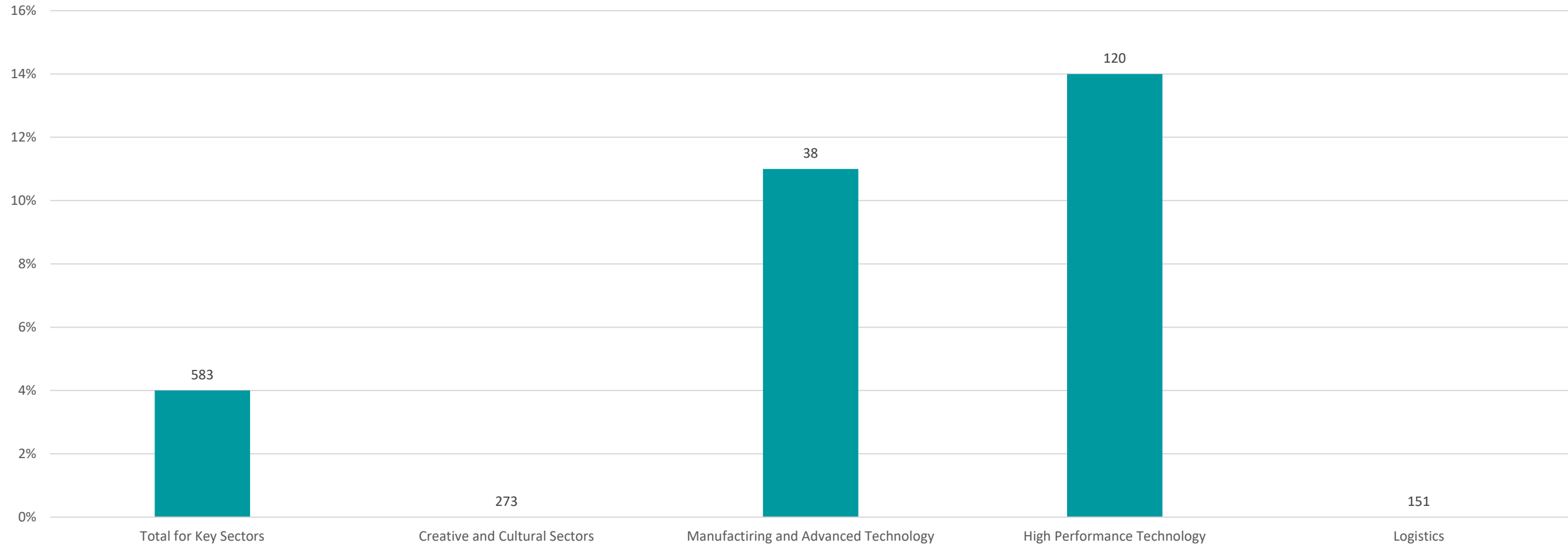


Our Business Survey suggests that digital infrastructure constrains growth for a minority of businesses

Source: SEMLEP Business Survey, 2019

NB: Aylesbury Vale was part of the SEMLEP area during the 2019 business survey, but is now no longer part of the SEMLEP area following the creation of the Buckinghamshire Unitary Authority.

% businesses citing IT Infrastructure as a constraint on business growth (unprompted list) by key sector, with sample sizes (SEMLEP Business Survey 2019)

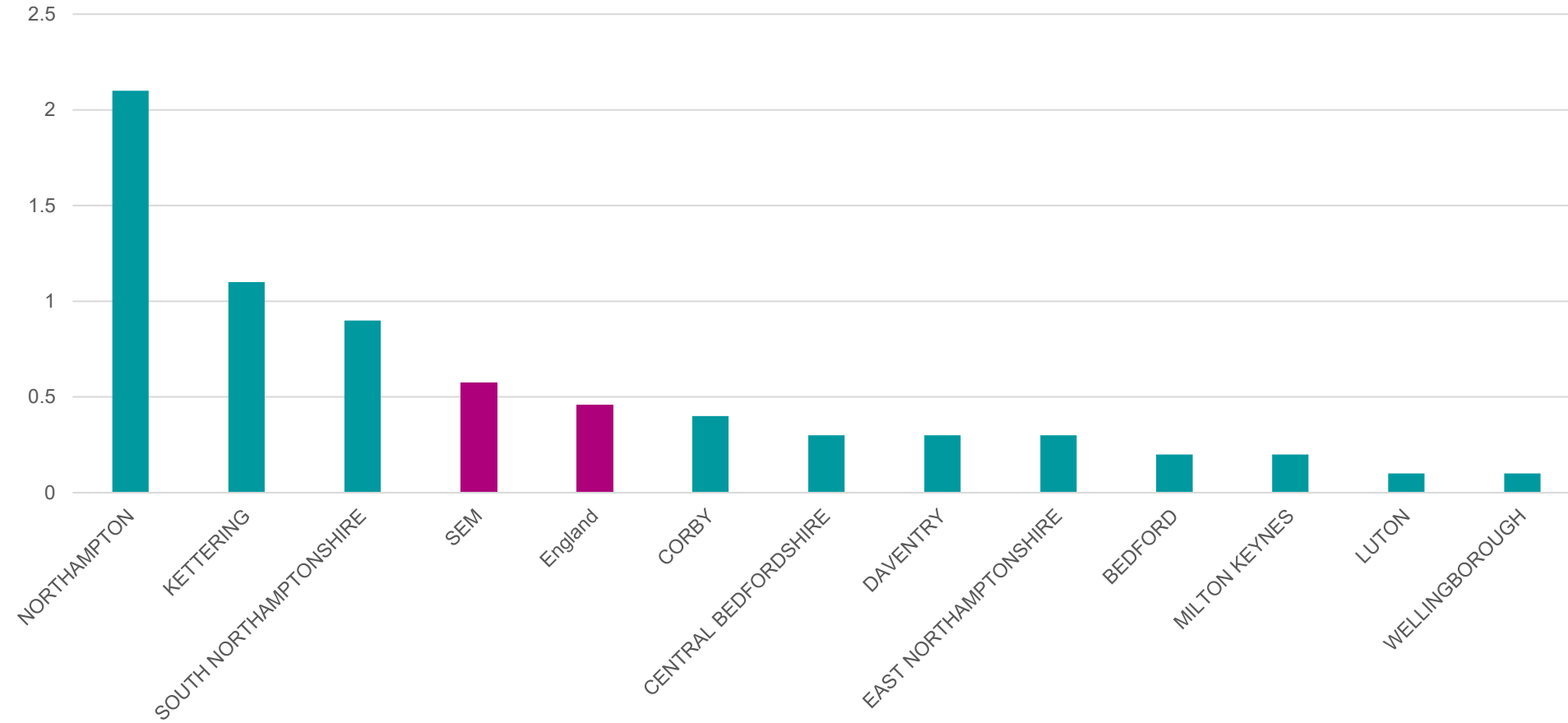


While the issue impacts a minority of businesses in key sectors, HPT and advanced manufacturing are disproportionately constrained by poor digital connectivity.



Coverage

% of eligible residential and commercial premises below the Universal Service Obligation by area (Ofcom Connected Nations 2020, lower is better)

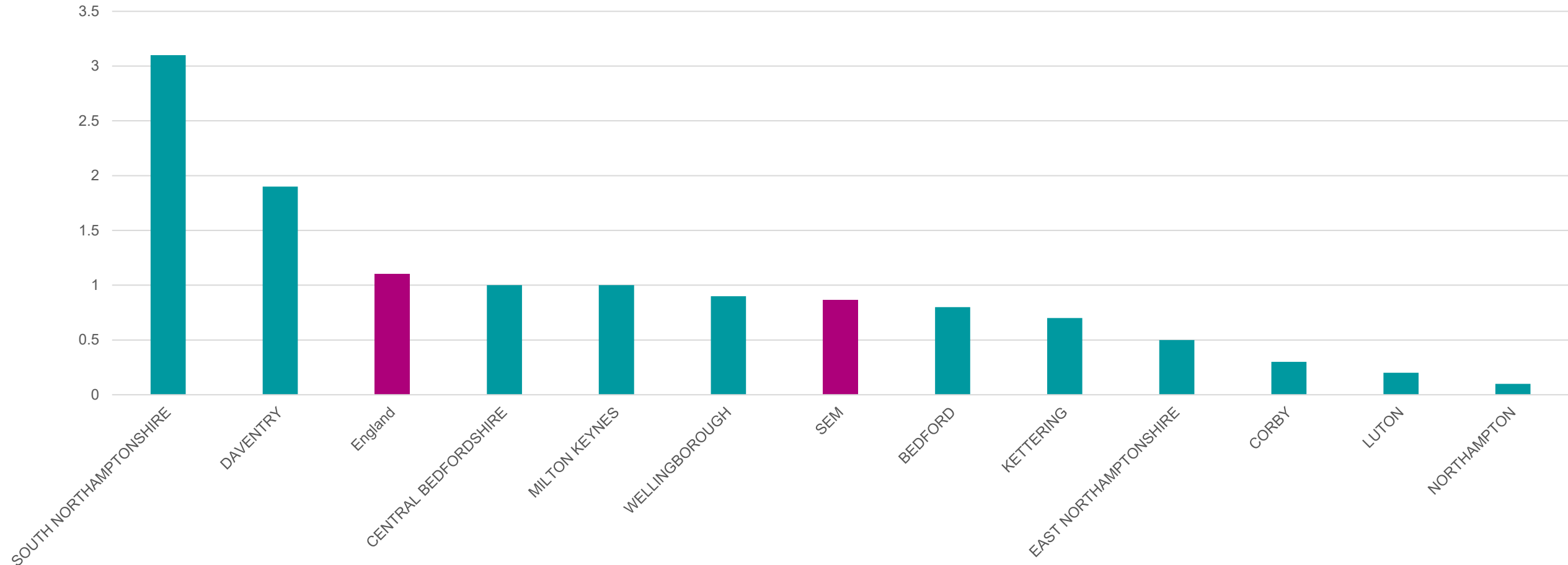


Universal Service Obligation

- All *eligible* homes and businesses have the right to request at least 10MBPS download and 1MBPS broadband.
- Passed in March 2018 and will come into force March 2020.

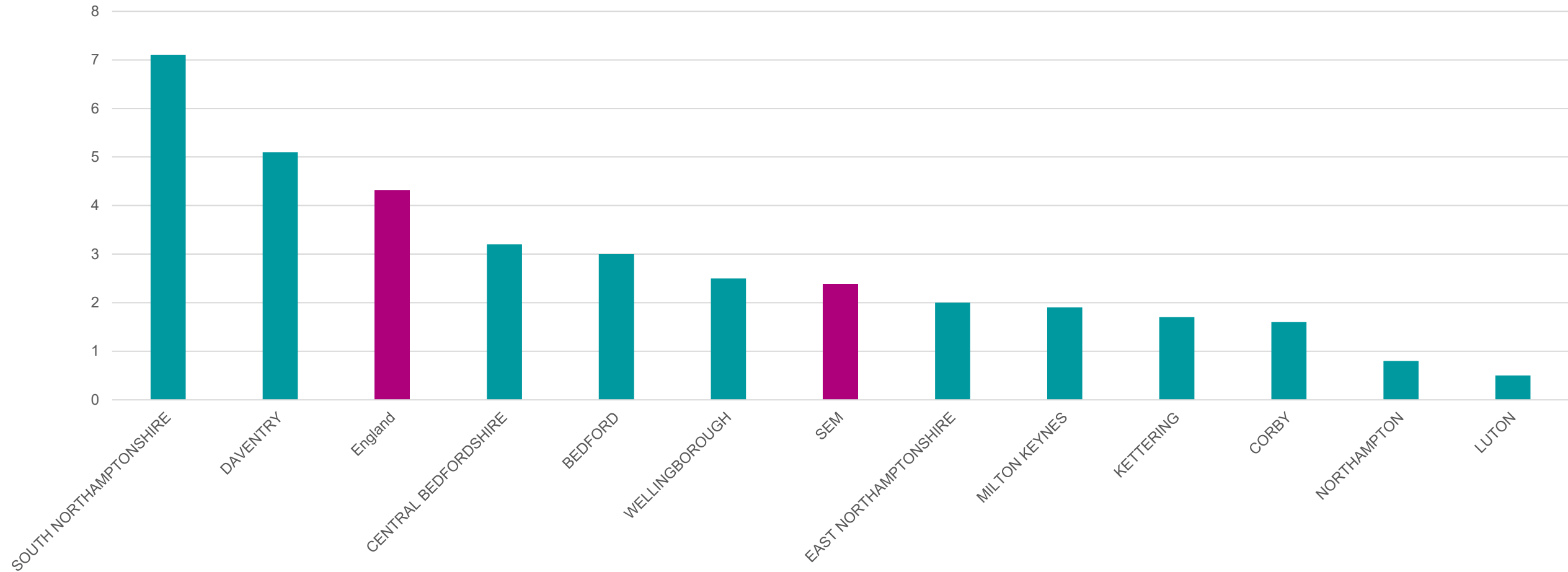
▲ The SEM area underperforms the national average in terms of USO coverage as a whole, although most local authorities outperform the national average.

% of premises unable to receive 10Mbit/s (Ofcom Connected Nations 2020, lower is better)



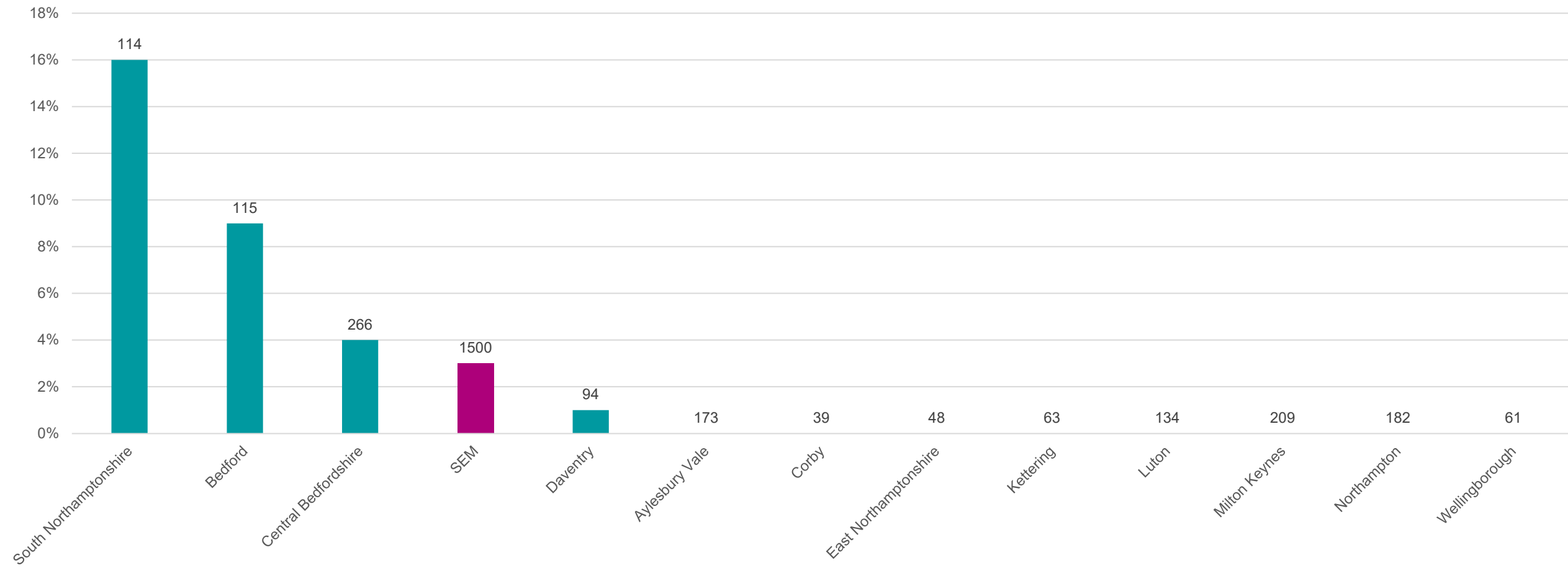
▲ However, when looking at all premises coverage is only slightly better than average in terms of basic speeds.

% of premises unable to receive 30Mbit/s (Ofcom Connected Nations 2020, lower is better)



However, coverage at higher speeds outperforms national averages, suggesting polarised coverage

% businesses citing IT Infrastructure as a constraint on business growth (unprompted list) with sample sizes (2019)

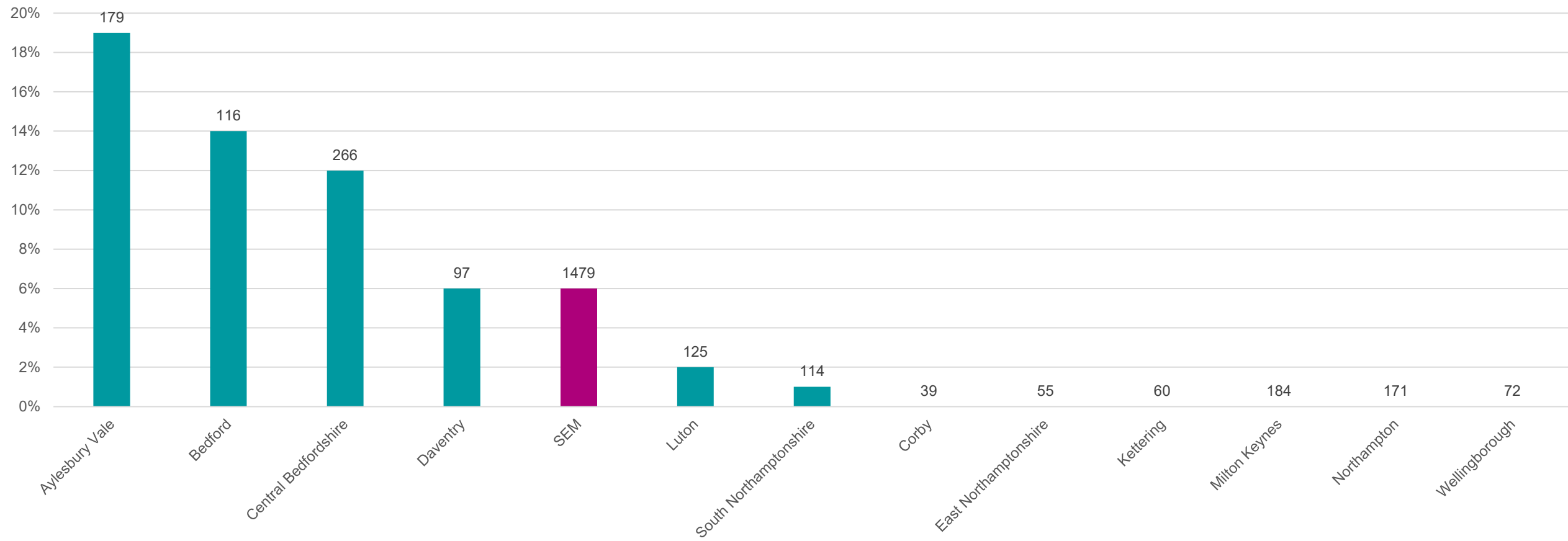


 **Concurrent with Business Survey, although note low sample sizes**

Source: SEMLEP Business Survey, 2019

NB: Aylesbury Vale was part of the SEMLEP area during the 2019 business survey, but is now no longer part of the SEMLEP area following the creation of the Buckinghamshire Unitary Authority.

% businesses responding 'improve other infrastructure such as broadband' to the question "What are the 3 most important things your local Council and other support organisations should do to help you grow your business?" with sample sizes

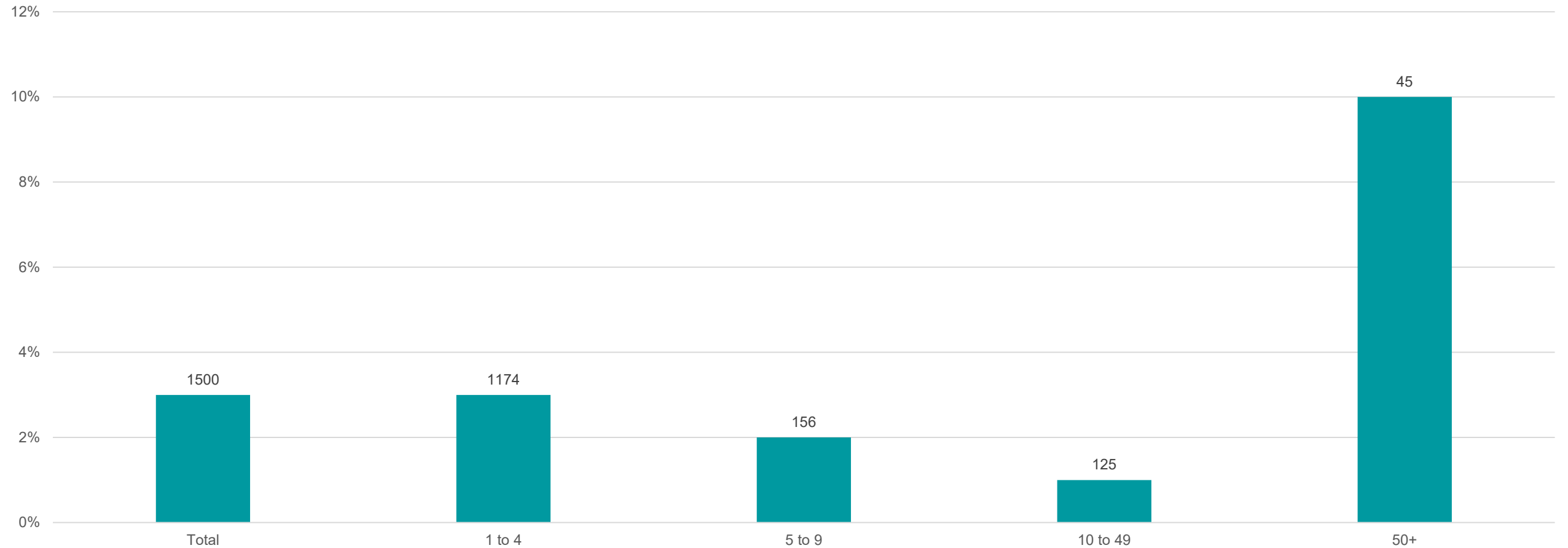


However, digital infrastructure is more of a priority for the Bedford and Central Bedfordshire areas

Source: SEMLEP Business Survey, 2019

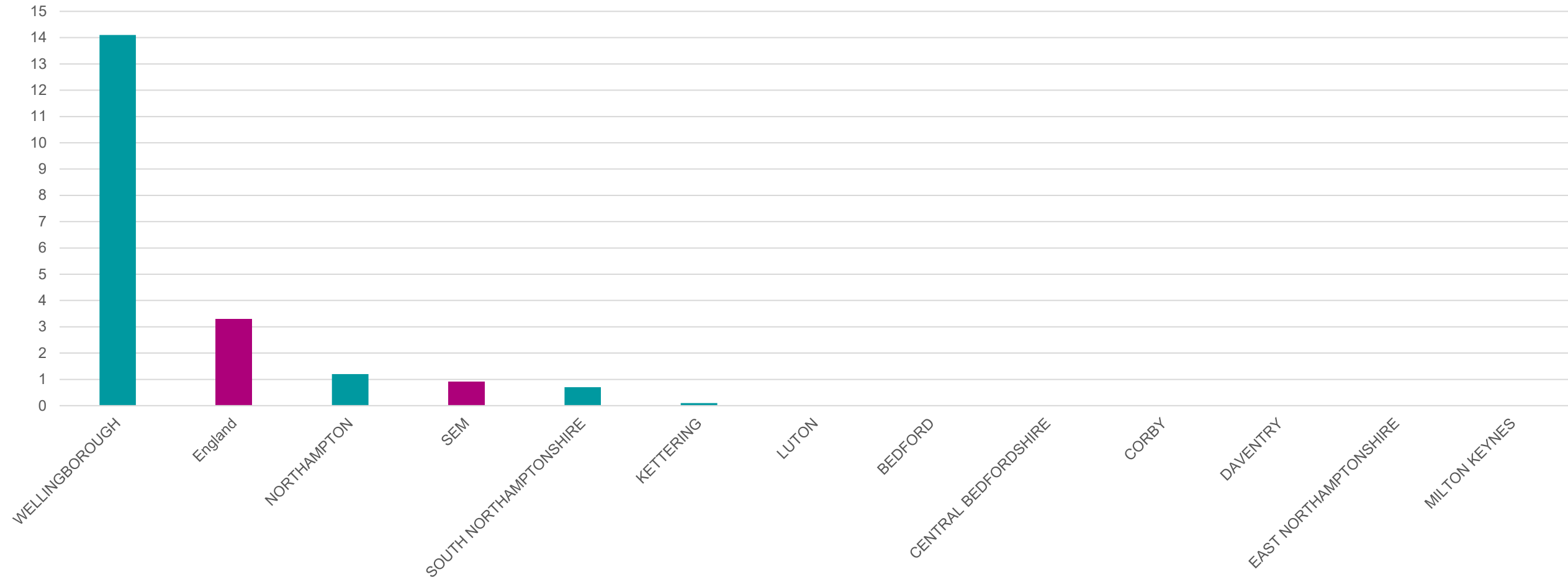
NB: Aylesbury Vale was part of the SEMLEP area during the 2019 business survey, but is now no longer part of the SEMLEP area following the creation of the Buckinghamshire Unitary Authority.

% businesses citing IT Infrastructure as a constraint on business growth (unprompted list), by number of employees, with sample sizes (2019)



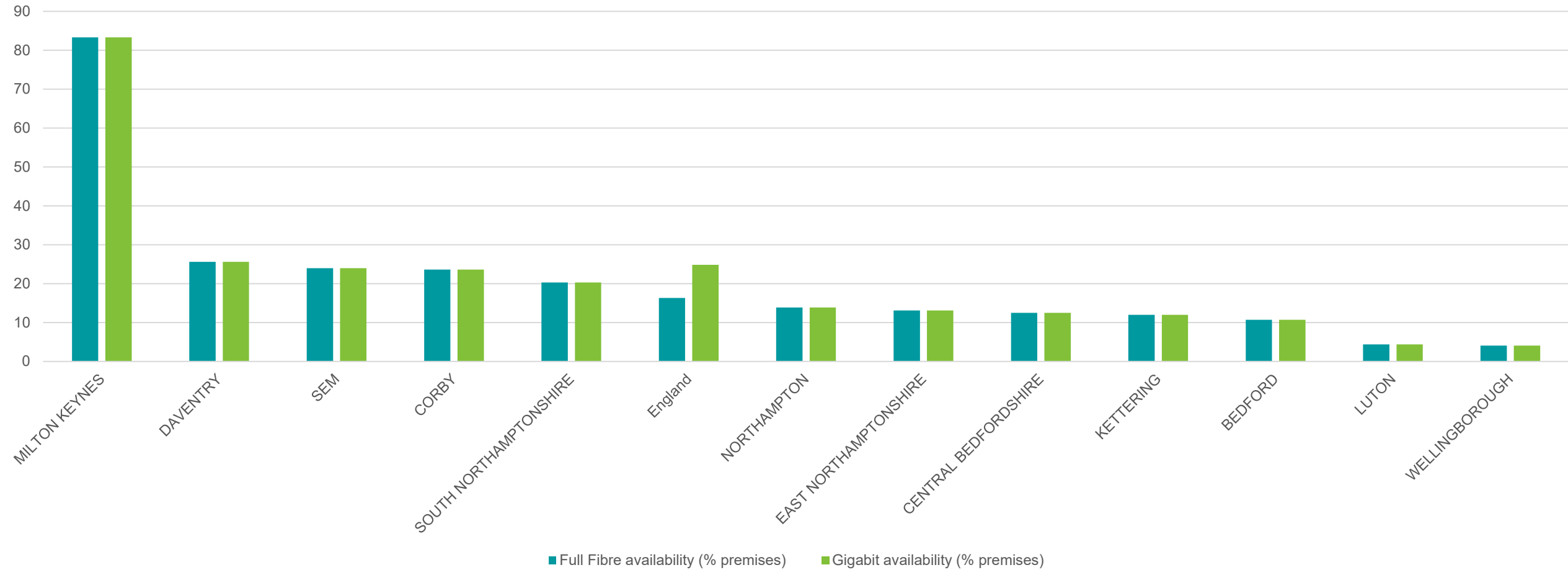
▲ **And disproportionately impacts larger businesses**

% of premises able to receive decent broadband from Fixed Wireless Access (Ofcom Connected Nations, 2020)



However, the area has low use of Fixed Wireless Access (FWA) compared to England as a whole, which could be a solution in areas where use of physical infrastructure is constrained

% premises with Full Fibre (FTTP) and/or Gigabit broadband available (Ofcom Connected Nations 2020, higher is better)



However, Full Fibre availability is slightly higher than the national rate, with particularly high availability in MK and Daventry. However, gigabit capable connections are slightly less common in the SEM compared to the national rate, apart from in MK. Virtually all Gigabit connections in the SEM are supplied through full fibre.

Council	% premises with Superfast Broadband (>30MBit/s)	% premises with Full-Fibre (FTTP)
Milton Keynes	99%	87%
South Northamptonshire District	97%	28%
Daventry District	97%	28%
Corby District	100%	24%
Northampton District	99%	17%
East Northamptonshire District	99%	16%
Central Bedfordshire	98%	16%
Kettering District	99%	13%
Bedford	98%	11%
Wellingborough District	99%	3%
Luton	100%	1%
England	97%	20%

Red: below national average

Green: above national average

Extracted 17 March 2021

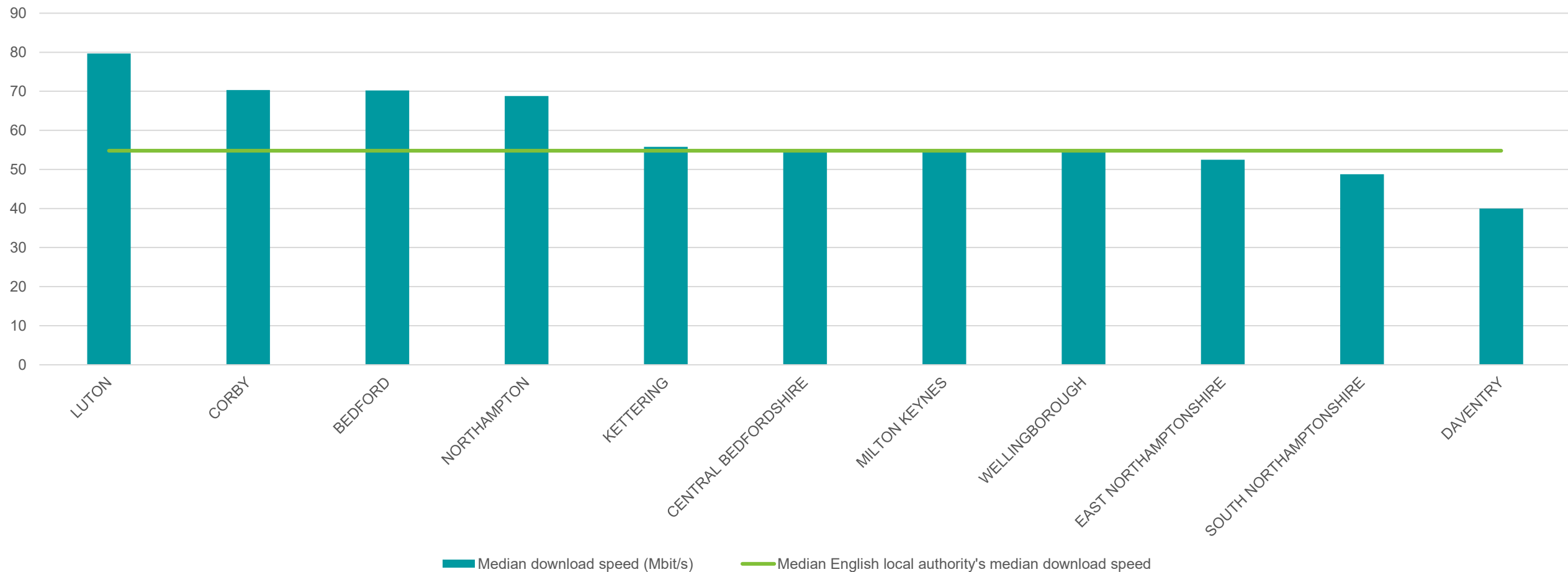
Source:
thinkbroadband.com

▲ Coverage statistics from thinkbroadband.com broadly align with what Ofcom reports



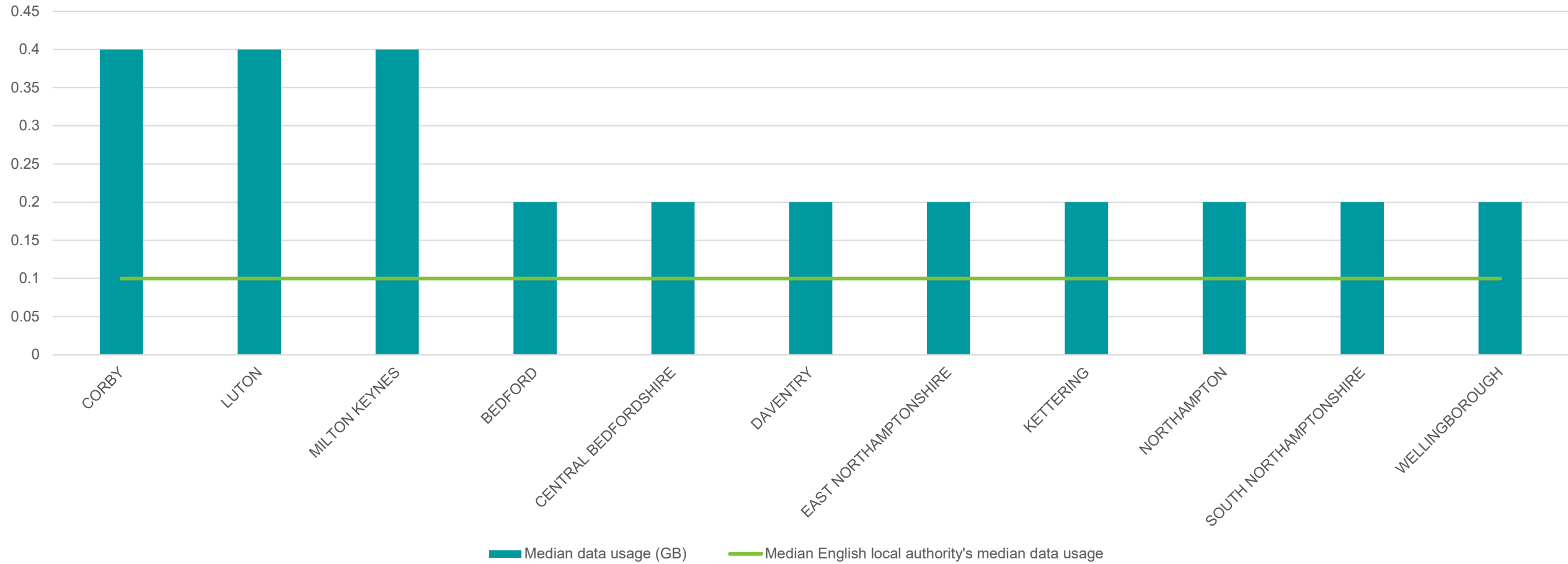
▲ Performance

Median Download Speed (MBit/s) per line, by LA (Ofcom Connected Nations 2020)

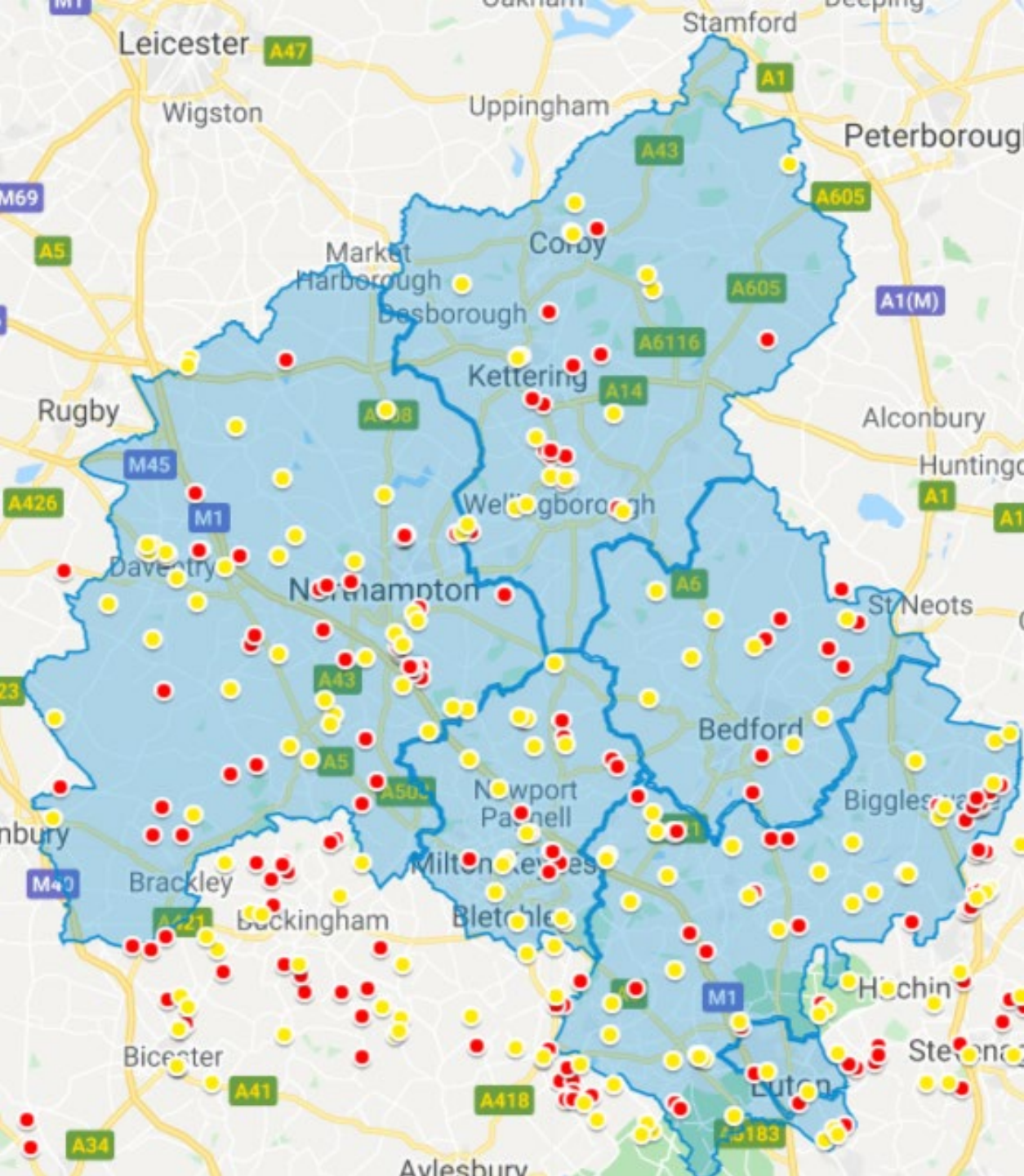


▲ Performance is generally good, equal to or above the median local authority in England in most SEM LA areas, but with some areas performing poorly.

Median data usage (GB, data downloaded and uploaded) per line per day by LA (Ofcom Connected Nations 2020)



However, data consumption across the area is generally above the national average. UK-wide data consumption continued to grow in 2020



Based on observations from 1st to 30th June 2020.

Yellow: <10 MBit/S average download speed

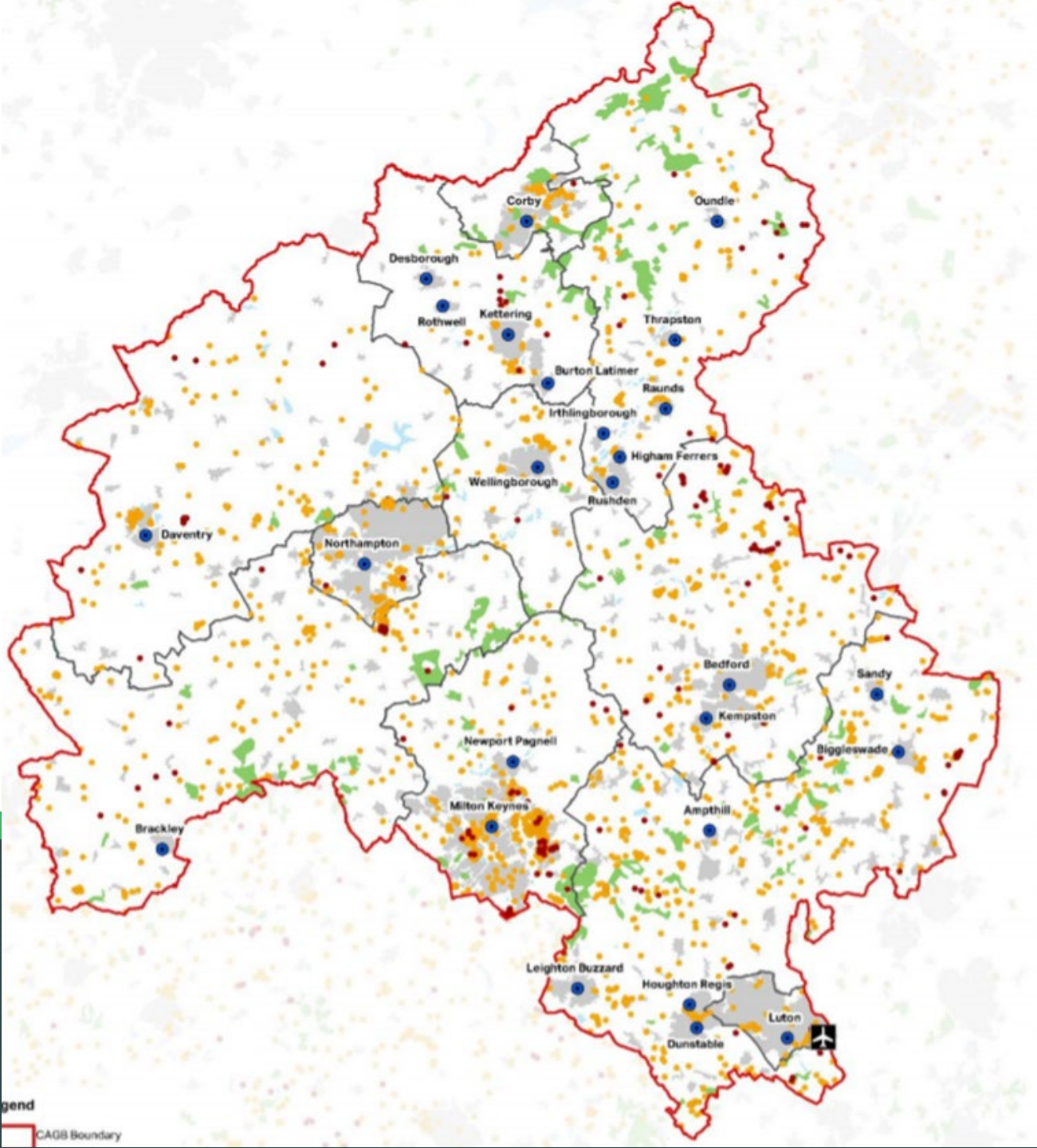
Red: <2 MBit/S average download speed

This map shows a significant improvement in access to basic speeds, compared with the 2017 map, particularly in MK and Bedford. However, there continues to be various pockets of poor performing areas.

https://www.google.com/maps/d/u/0/edit?mid=1iRjz_3YOLvHnPxn2wqv8EFbP3ITWc3wZ&usp=sharing

Digital infrastructure map: average download speeds below 10 MBit/S

Source: Ofcom Connected Nations 2020 (SEMLEP analysis)



Legend

 CAGB Boundary

 Woodland

 Waterbody

 Urban Area

 Town

 Airport

Average Download Speed (Mbit/s)

 <math>< 2</math>

 <math>< 10</math>

Source: Central Area Growth Board Infrastructure assessment (AECOM, 2019)

Although there has been some improvement on 2017 performance

Areas where coverage are poorest are West Northamptonshire, Bedford and Central Bedfordshire

Performance is also poor in West Northamptonshire, and parts of North Northamptonshire

There are numerous clusters of poor performance across the area, particularly in rural areas.

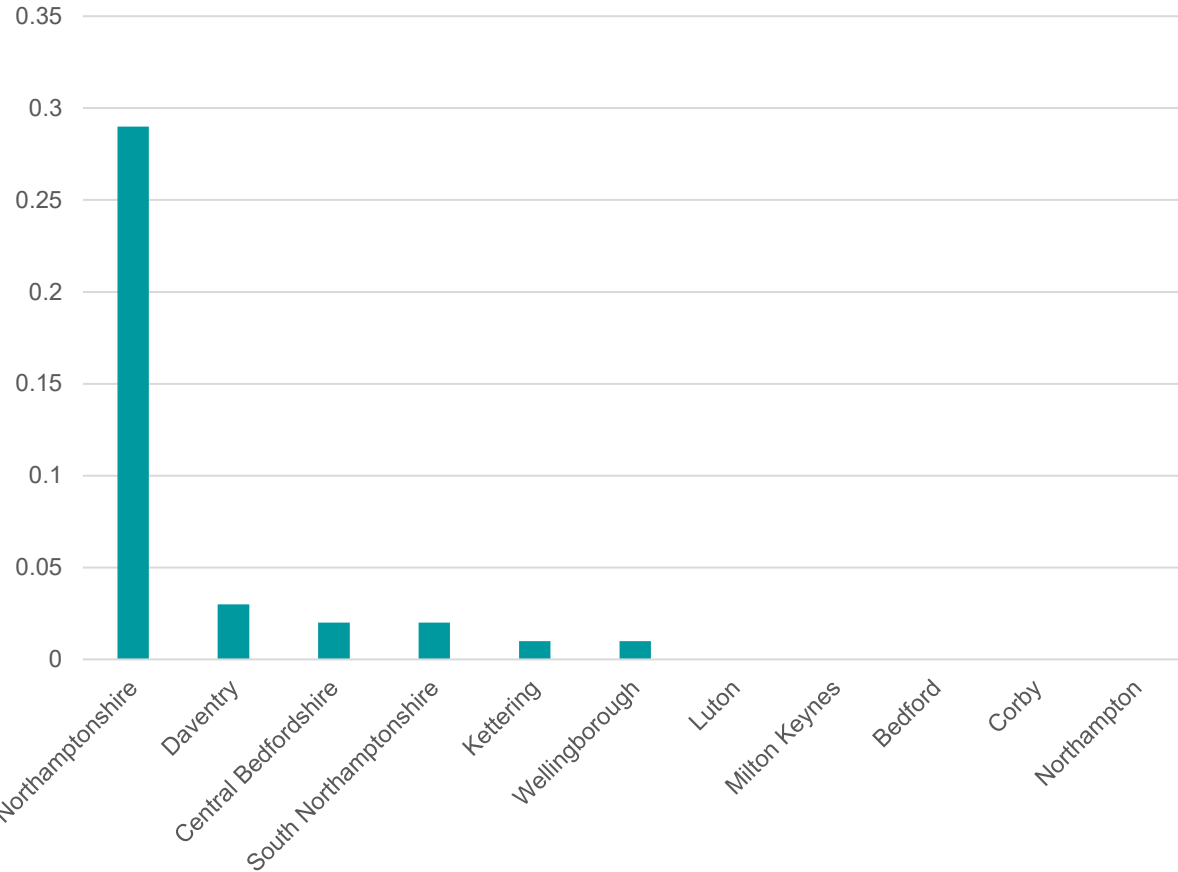
Coverage in the area also tends to be polarised, where the infrastructure quality is either good or very poor

▲ Conclusions: Broadband

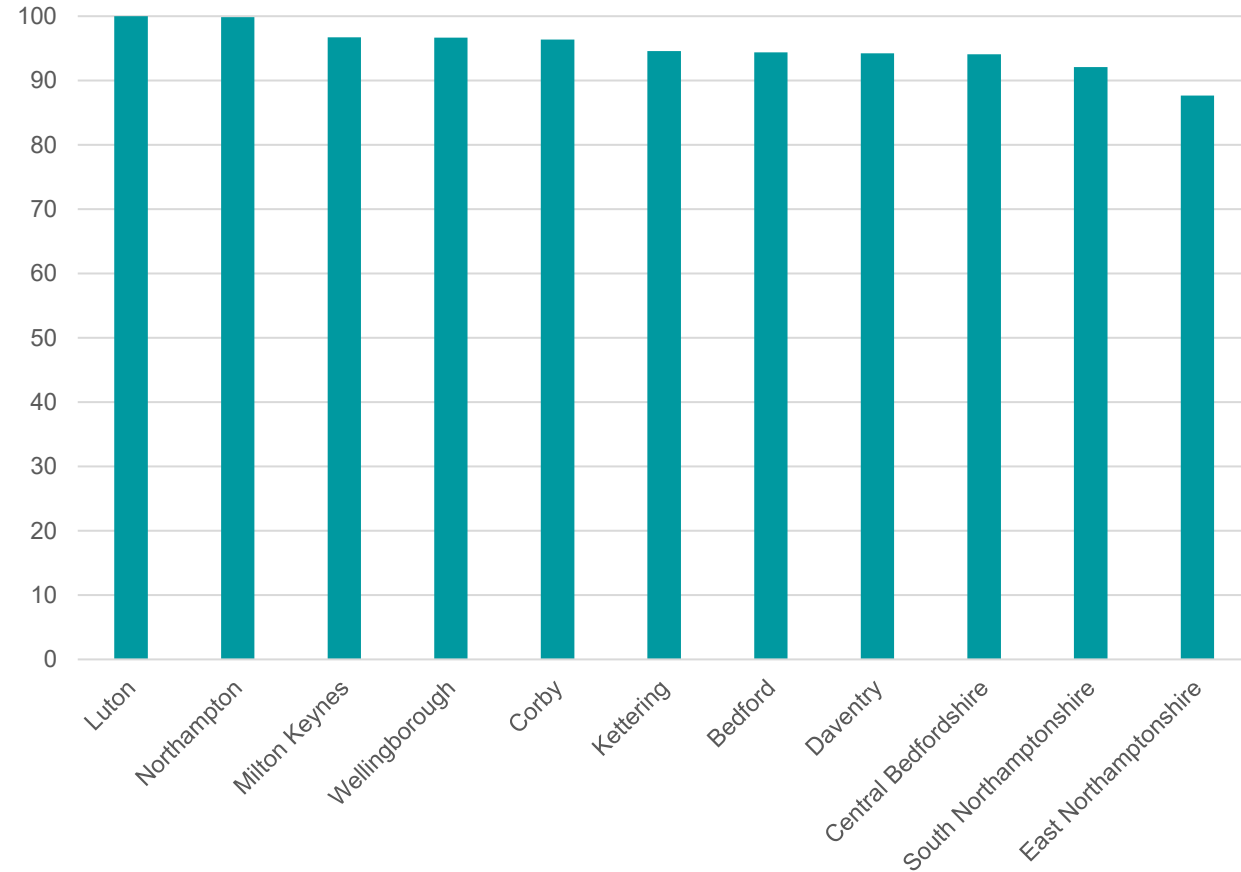


▲ Mobile connectivity

% Geographical area with no outdoor 4G coverage from any operator (Ofcom Connected Nations 2020, lower is better)

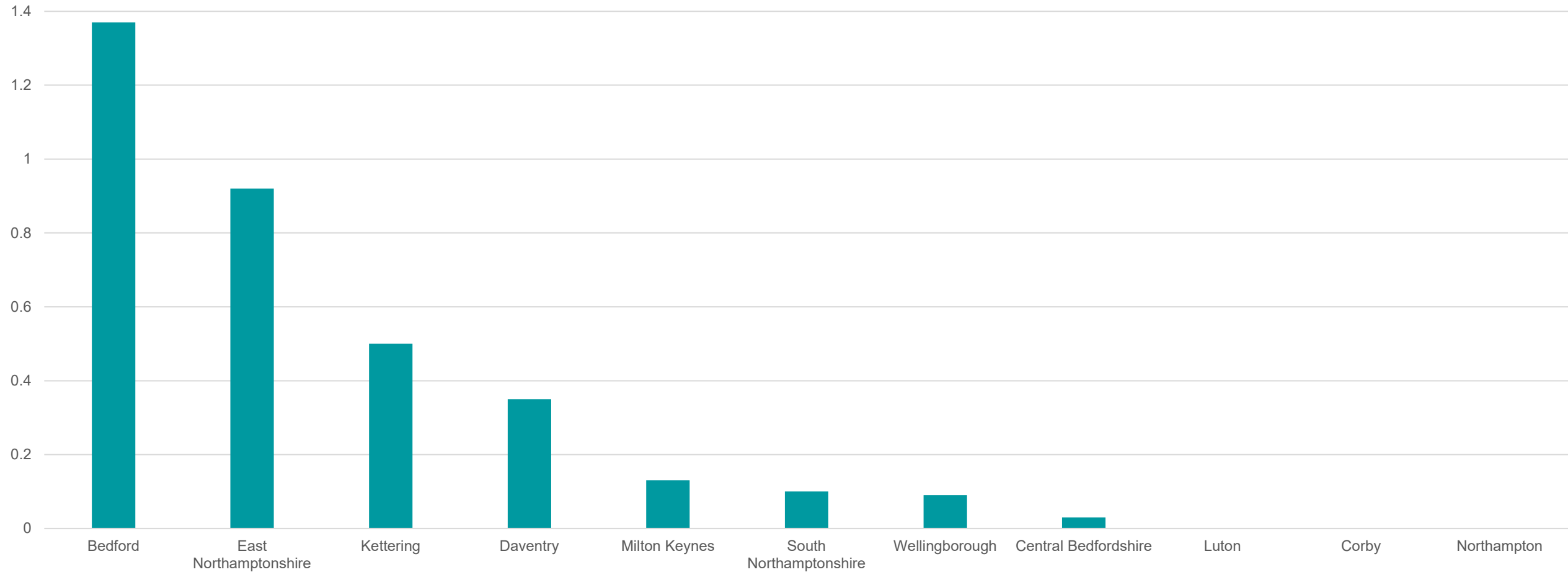


% geographical area with outdoor 4G covered by all operators (Ofcom Connected Nations 2020, higher is better)



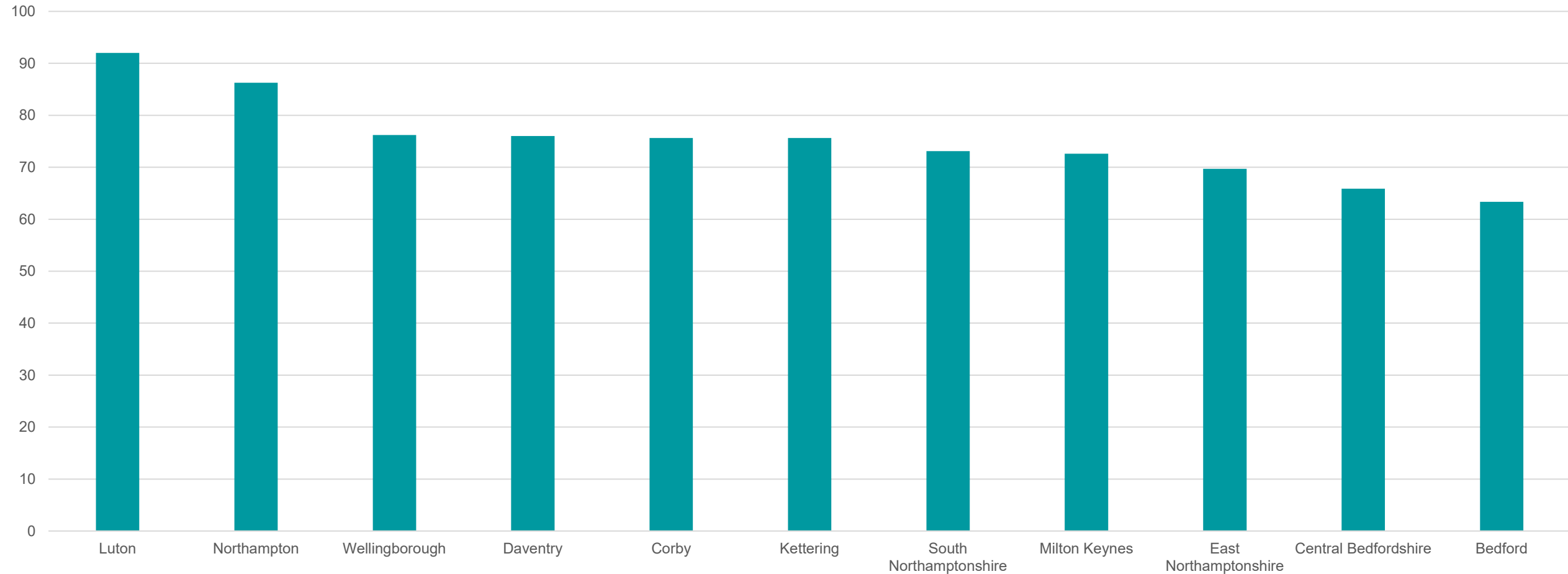
Geographical coverage is generally good, although rural areas have significantly worse coverage, particularly in East Northamptonshire. (NB: 4G defined here as minimum download speed of 2MBit/S, plus ability to make a 90 second call with no interruption)

% A&B Road area with no 4G signal (Ofcom Connected Nations 2020, lower is better)



Basic 4G coverage on roads is generally good, although not spots are more common in Bedford and East Northamptonshire.

% A&B Road area with 4G signal from all operators (Ofcom Connected Nations 2020, higher is better)



▲ **But, broad coverage on A&B roads across all operators is less strong**

There are patches of poor 4G coverage in Northamptonshire, and in rural areas.

The 4G coverage on the road network tends to be patchy to the East of the SEM

A key aim should be to ensure coverage is provided from multiple operators across the area.

Focus should be given to the supporting connectivity on the road network, where 4G connectivity is more inconsistent.

▲ Conclusions: Mobile Connectivity

Shared Rural Network

- £1bn fund, aimed at helping to deliver 95% 4G coverage of UK landmass by 2025 through targeting rural areas.
- Translates to 98% 4G coverage from at least one operator, and 90% coverage from all four operators.
- Agreement to be signed between government and mobile operators.
- Complements other Government policies to improve digital infrastructure by making it easier and cheaper for the private sector to deploy faster broadband to the most commercial areas of the country; new legislation to make it easier for telecoms firms to connect blocks of flats; and plans to mandate gigabit-capable connectivity in new build premises.

Superfast Northamptonshire

- County Council run project, working with OpenReach and Gigaclear to deliver superfast broadband and full-fibre connectivity.
- By end March 2021, aims to have at least 99% of premises in the county with access to superfast broadband and 65% with ultrafast
- Up to 6,300 rural premises are due to benefit by end 2019 / early 2020.

Delivery mechanisms and funding opportunities (I)

Community Fibre Partnerships

- Communities that are not serviced by a commercial or publicly funded broadband deployment programme, can form a community-led deployment project.
- Typically the community will fund these projects with the support from the government voucher schemes, examples include [Broadband for the Rural North \(B4RN\)](#) and [Fibre for Rural Nottinghamshire \(F4RN\)](#).
- BT has launched a campaign to make it easier for local groups and communities to co-fund digital infrastructure in their area.

Gigabit Broadband Voucher Scheme

- Allows businesses to claim up to £2,500 against the cost of installing a gigabit capable connection
- Residents can claim for vouchers worth up to £500.
- Total fund worth £67m, active since 2017
- Government has also pledged £5bn to subsidise gigabit capable broadband roll-out in harder to reach areas, although likely through a separate programme.

Delivery mechanisms and funding opportunities (II)

Wholesale Asset Re-use Platform (WARP)

- E-commerce platform which makes public sector assets more visible to telecoms providers.
- WARP can map any and all commercial broadband networks, applying standard broadband product and process overlays, agreed with industry
- Aggregates the opportunity, making independent providers more visible. Shows what has been installed and where, and what opportunities could be to expand.

Openreach Hard-to-reach Full-Fibre trials

- 4 of the 13 trial locations were in Bedfordshire, including Cranfield, Shefford, Clifton and Henlow
- Opportunity for generating learning and skills required to deliver gigabit capable connections in rural areas.

CityFibre Milton Keynes

- Delivered via a strategic partnership with Vodafone, CityFibre will bring Gigabit-capable broadband to up to 1 million UK homes and businesses by 2021.
- Made possible by a £40m city investment from CityFibre, impressive progress has been made in the rollout of the MK gold-speed network.
- Has created a Centre of Excellence in MK to train new workers, driving future fibre projects.

▲ **Delivery mechanisms and funding opportunities (III)**



- According to the response from ‘New Build Developments: Consultation on delivering gigabit-capable connections,’ government will be **legislating for new build properties to have gigabit capable broadband as standard**. This will be achieved through amending the Building Regulations Act 2010.
- Government has also secured the following commitments from network operators to enable this policy:
 - Contribute a minimum amount to the cost of connection, between £500 and £1,400, with a developer cost cap set at £2,000 (excludes developments of under 20 premises, 99% all new build)
 - Work with developers to ensure premises which cannot be provided with a gigabit-capable connection within the above overall cost envelope can be connected with the next best technology that can be provided within the cap
 - Openreach has published a new price structure that reduces the costs developers pay for connecting two premise developments from £3,100 to £2,000, bringing all developments of two premises or more within the proposed cost cap
 - Openreach have also publicly committed to connect all new build developments over 20 premises for free, reducing this from their current offer of 30 premises
 - USO will continue to apply, where a minimum 10Mbit/s connection must be installed if possible within a £3,400 cost cap.
- Telecommunications Infrastructure (Leasehold Property) Bill, will legislate to make it easier for network operators to install broadband infrastructure in blocks of flats.

Recent digital legislation



▲ Literature Review

UK: Superfast Broadband Programme

Superfast Broadband Programme – State aid Evaluation Report

- Government programme covering 5.5m business premises, supplying them with new superfast broadband infrastructure.
- Not a RCT, so researchers used staggered installation to compare the economic impacts on treated and non-treated firms participating in the programme.
- Benefits were evaluated over the period 2012 – 2018. However, the research ignores the potential negative consequences on businesses not included in the programme, such as employment displacement, as well as how businesses not in the programme may have responded to improved infrastructure if they were included.

Findings:

- Local employment impacts: Subsidised coverage was estimated to have increased employment in the areas benefitting from the programme by 0.6 percent, leading to the creation of 17,600 local jobs by the end of 2018.
- Benefit-Cost Ratio estimated at between £2.7 and £3.8 per £1 spent, across 2021-2019.
- Turnover per worker: There were also signals of efficiency gains - turnover per worker of firms in the areas benefitting rose by 0.4 percent in response to subsidised coverage. This was not solely driven by more productive businesses moving into areas with improved broadband infrastructure.
- Firms that did not relocate over the period also saw their turnover per worker rise by 0.7 percent by 2018, indicating that subsidised coverage has also raised the efficiency of firms.

Norway

Akerman, A., Gaarder, I., & Mogstad, M. (2013). The Skill Complementarity of Broadband Internet. IZA Discussion Papers 7762. Institute for the Study of Labor (IZA)

- Government introduced \$180m new broadband infrastructure.
- Not a RCT, researchers use uptake proportion as an instrument to capture endogeneity from selection bias.
- Instrument works as areas with low-uptake should have a weaker responsiveness to the new infrastructure, than areas with a high uptake.
- Controls for area and time fixed effects, not captured under DID.

Findings:

- Broadband augments productivity for skilled workers, doing non-routine tasks.
- Connectivity tends to replace routine tasks by low skilled labour, and thus reduces productivity.
- Effects only explain a few percent in the change in productivity.

USA Agriculture

Kim, Y; Orazem, P (2012). Broadband Internet and Firm Entry: Evidence from Rural Iowa. Iowa State university Working Paper No. 12026.

- 2002-3 US subsidised broadband infrastructure loans to increase coverage in rural areas.
- Pilot scheme ran initially in areas with metropolitan links, before being rolled out to mass market.
- Estimated a DID-PSM, controlling for bias due to wealthier areas receiving more investment.

Findings

- Positive effects in areas with metropolitan links (pilot scheme).
- Zero to negative effect during mass-roll out, suggesting broadband may replace low skilled labour or be ineffective due to a lack of complementary interventions.

Australia

Reeson, Andrew & Rudd, Lachlan. (2016). ICT Activity, Innovation and Productivity: An Analysis of Data From Australian Businesses. *Economic Papers: A journal of applied economics and policy*. 10.1111/1759-3441.12145.

- Firm level study, focusing on SMEs
- Also focuses on the manufacturing sector

Findings

- Broadband benefits only realised when implemented alongside other IT upgrades
 - Video communications
 - Virtual private networks (internal communications and admin)
 - Supply chain management applications.
- Concludes that broadband is not useful unless it is implemented alongside tools to take advantage of it.
- Corroborates with Norway, in that broadband itself only assists non-routine tasks. Routine benefits are derived from software upgrades.

UK

De Stefano, T; Kneller, R; Timmis, J (2014). The (Fuzzy) Digital Divide: The Effect of Broadband Internet Use on UK Firm Performance. University of Nottingham Discussion Papers in Economics. Discussion Paper 14/06.

- Uses a firm level regression discontinuity design, exploiting a natural boundary of broadband availability.
- Controls for firm size but not differences in skill levels or sector. Uses sales per worker as a productivity proxy.
- Should also be noted that financial businesses are excluded from the sample, and sector / organisation effects are not measured.

Findings

- No robust effect of broadband use on productivity.
- However, broadband is not a proxy for organisation change, which could be the main cause of productivity changes.
- Furthermore, the productivity impacts may have been constrained to certain sectors or organisations, which was not analysed as part of this report.

Ireland

Haller, SA; Lyons, S (2012). Broadband Adoption and Firm Productivity: Evidence from Irish Manufacturing Firms. MPRA Paper 42626.

- Not done in response to a government program.
- Uses a similar method to the Norwegian study, with a similar instrument, but ignores differences in labour skill levels.
- Observes heterogeneity in the effects of different broadband technology.

Findings

- More productive firms are more likely to use DSL connections.
- As a result, zero/ambiguous causal effect on productivity.
- Some minor evidence that urban areas benefit more than rural areas, but not significantly.

Digital Skills and access during the pandemic

- Lloyds Bank UK Consumer Digital Index 2020 estimates that 9 million people in the UK can't use the internet or their device without help, and 4.7 million people don't have any digital skills at all.
- A national survey by BT found that 43% of 25-30 year olds say their wellbeing has been impacted due to a lack of digital skills or online access, compared to 10% of over 55s
- When it comes to financial barriers to accessing online technology, the research found more than a quarter of people worry they will not be able to afford new technology if their devices break, including 27% 16-24 year olds who were concerned the most.