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Mobile matters

Researching people's experience of using Android mobile services

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Overview

Ofcom has researched consumers' behaviour and experience of using mobile services in the UK by analysing crowdsourced data collected from Android[1] devices[2]. The dataset was licensed to Ofcom by network benchmarking specialists P3, and contains information relating to mobile end-user experience and the performance of the networks to which people are connected.

In this report we publish findings from data collected between 1 January and 31 March 2019. We report on a range of metrics, including the share of connections across network technologies, data service availability, response time and usage patterns throughout the day, and how these vary by factors such as location, network technology, day of week and time of day.

This research is part of a wider programme of work by Ofcom to research and provide information about mobile quality of service. The data in this report relate to performance when network coverage is available from an operator, while Ofcom's broadband and mobile checker app provides detailed information about mobile coverage from all four mobile networks across the UK.

What we have found

We found that just over two-thirds of the time (69%), people were connected to wifi rather than cellular networks when using their mobile devices. When they were connected to cellular networks (2G, 3G, 4G), 82% of the time was spent connected to 4G. This varied depending on where people were and which mobile network they used. People in urban areas were more likely to be connected using wifi – and in turn 4G – than those in rural areas, which can be attributed to the greater access to wifi in offices and public spaces, and higher availability of 4G networks in urban areas.

But often a connection is not enough: the majority of mobile apps need access to data services in order to provide full functionality. Our analysis shows that when people were connected to 4G networks, they were able to use data services on average 98.8% of the time. This average was lower for 3G connections, which were nearly four times more likely to fail than 4G connections. Throughout the day the proportion of tests that failed on both 3G and 4G remained constant, despite more people connecting to the network during peak times.

One thing that did vary significantly throughout the day was consumers' data use. The proportion of data used on cellular networks peaked between 5 and 6pm, when people were likely to be travelling home from work, while the proportion of wifi use was higher between 6 and 10pm when they were more likely to be at home and have access to wifi.

[1] The operating system used on iPhones (iOS) has restrictions on apps running in the background and being able to access network performance data. Therefore, data collection on iPhone devices is currently not available.

[2] Including mobile phones, tablets and other Android devices with a SIM card.

The amount of data used over wifi was much higher than on mobile technologies; only 10% of people used more than 5GB of mobile data on average each month, compared to 47% on wifi. Just under half of people used less than 500MB of mobile data each month.

Mobile calls remain an important means of communication for many people, with our crowdsourced data showing that only six per cent of people did not make a call during the three-month fieldwork period. For the 94% of panellists who did, almost a third made more than 50 calls per month. However, calls were fairly short on average; over eighty per cent of calls were shorter than five minutes, with the majority of these under ninety seconds, indicating that people are making frequent but relatively short calls.

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Introduction

Purpose of the research

With growing demand for continuous connectivity, people expect to be able to access online services whenever and wherever they are. Seamless movement between wireless networks, the availability of internet services, data and call allowances are all important factors that affect our expectations and experience of using mobile networks. The data analysed in this research give vital information about this experience across the UK, which helps inform Ofcom's policy making.

In May 2018, we published our second Consumer Mobile Experience Report, based on data collected via an Ofcom-branded app installed on around 5,300 Android smartphones. This app was discontinued in July 2018 and we have since licensed a dataset from P3, an independent company specialising in crowdsourced data collection[3] and international network benchmarking. The objectives of discontinuing the app and using this larger dataset were to gain deeper insight into mobile network performance across the UK and how this varies by a number of factors, including geography, time of day and technology used, and also to gain greater insight into consumers' use of Android devices.

Notes on the data included in this report

The upfront metrics in this report – network share and data service availability – are based on tests run while the phone is connected to a network. These tests are run on the highest data network technology at the time, as determined by the device, and recorded as either successful or unsuccessful. We are consequently unable to state whether unsuccessful tests would have succeeded on a lower data network technology, so 3G and 2G data service availability may be underestimated. The metrics do not represent a measure of overall network coverage, as they only reflect data availability when the phone is connected to a network, and because the levels of service quality we use to measure coverage cannot be guaranteed.

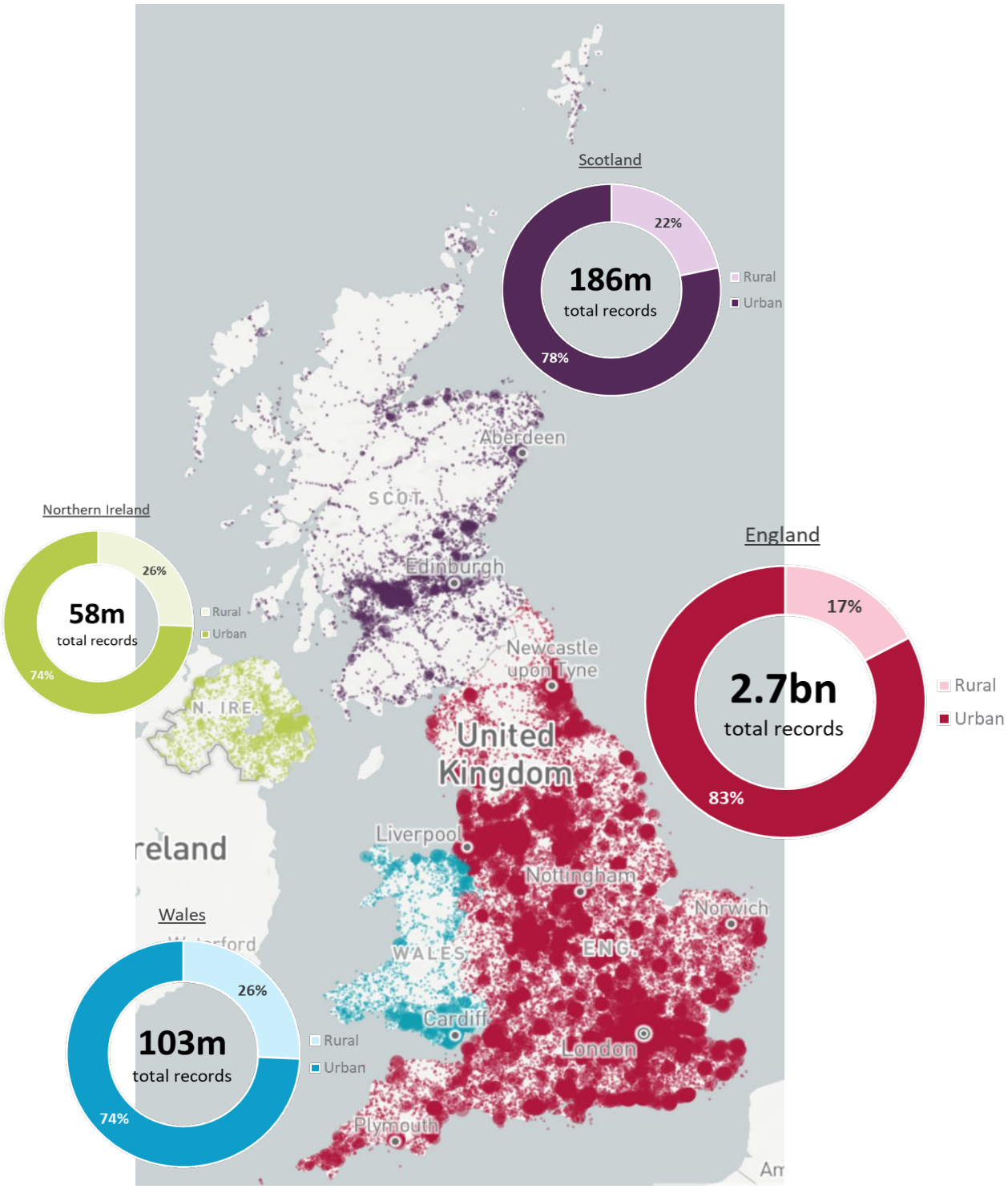
All analysis is conducted at the wholesale mobile network provider (MNO) level. References to the performance of the four MNOs (EE, O2, Three, Vodafone) may also include the performance of panellists who are customers of mobile virtual network operators such as Tesco Mobile, GiffGaff and Virgin Mobile.

The analysed metrics are only some of the factors that people may wish to consider when making decisions about their mobile service. Price, handset type, quality of customer service, coverage and contract terms are other relevant aspects that should be taken into account.

[3] Crowdsourcing is the use of data from a large number of people and, in this particular case, their mobile devices. These data are automatically collected and made available for analysis.

Outline of crowdsourced data

The findings in this report are based on analysis of a dataset containing more than 3 billion records generated from about 150,000 Android device users over a three-month period. The spread of these records across the nations and regions is a good indicator of where mobile users were living, working and travelling in the UK during the data collection period.



For a more detailed description of the data collection and analysis, please see Annex 1: Technical Methodology and Annex 2: Statistical Methodology.

Network share

What is network share?

This metric provides an overall picture of how people are connecting to wireless networks, wherever they are, with their Android mobile devices. More information on how this is measured is available in Annex 1: Technical Methodology, and breakdowns of the data can be found in our interactive report.

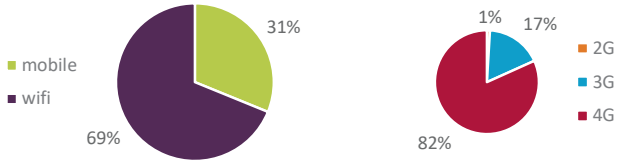
How people connect to networks

Two-thirds of the time, people were connected to wifi rather than to a cellular network (2G, 3G or 4G). This varied significantly by location and network operator. People in urban areas were more likely than those in rural areas to be connected to wifi, which is probably due to greater access to wifi in offices and public spaces. However, the majority of daily wifi use is during the evenings, when people are more likely to be using it at home. Similarly, wifi share was higher at the weekends, when people tend to spend more time at home, than during the week.

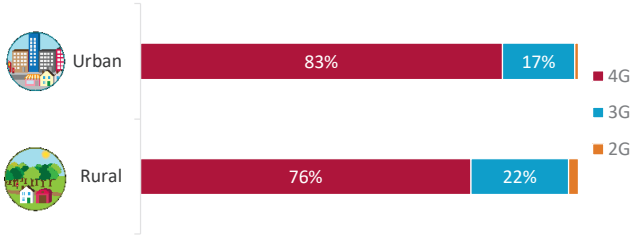
For connections made via cellular networks only, the data show that people were connected to 4G 82% of the time, with most of the rest spent on 3G (17% compared to 1% on 2G[4]). This varied by rurality; people in urban areas were connected to 4G for 83% of the time as opposed to 76% for those in rural areas.

Panellists using the EE network spent the highest proportion of time connected to 4G (90%), while those using the Three network spent less time on 4G (78%) and more time connected to 3G (22%) than those using either EE, O2 or Vodafone. This is likely to be related to a combination of 4G network coverage and network management. For many activities, such as reading the news or browsing social media, the performance of a 3G connection can be as good as a 4G connection, and operators may revert consumers to a 3G connection in weaker signal areas to provide a better connection or to more efficiently manage their network and ensure a good connection experience for as many people as possible.

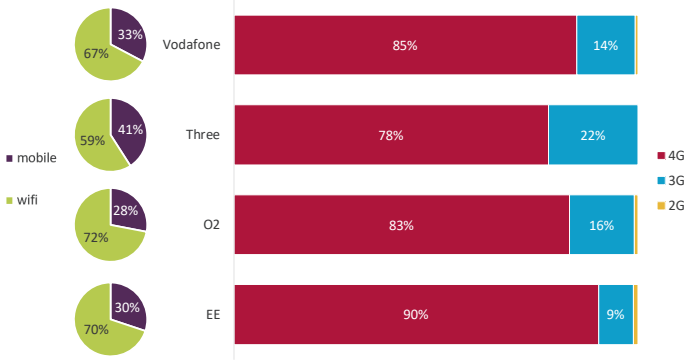
Average network share by network technology



Average mobile network share by rurality



Average network share by mobile network



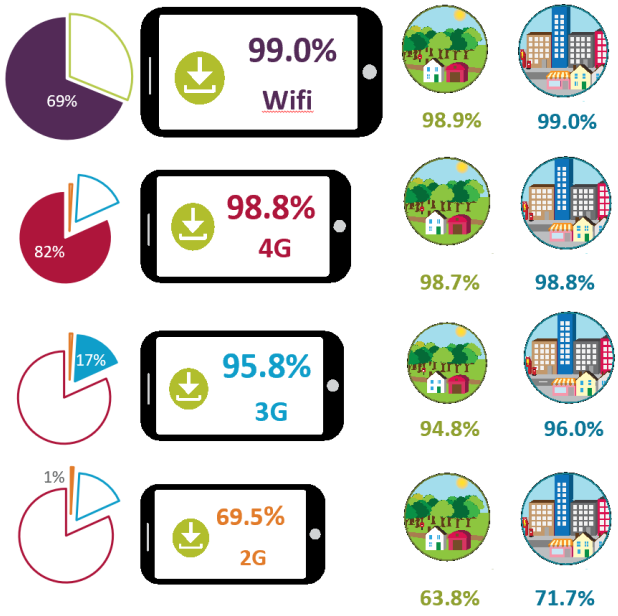
[4] Figures rounded to nearest whole percentage

Data service availability

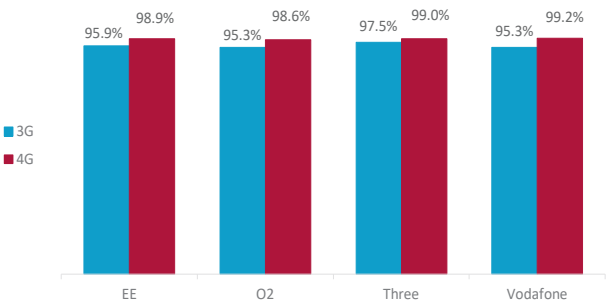
What is data service availability?

With mobile phones increasingly important for everyday tasks like checking emails, reading the news and paying for groceries, people rely on being able to connect to data services wherever they are. This metric shows the proportion of times people successfully access data services while connected to a network. It is not a measure of coverage, but shows how well demand for data services was satisfied when a network was available. More information on how this is measured is available in Annex 1: Technical Methodology, and breakdowns of the data can be found in our interactive report.

Average data service availability, by technology and rurality



Average data service availability, by mobile technology and mobile network



When people can use data services

The data collected reveals how often people could access data services when they were using their Android mobile devices and connected to a network. On average, people could use data services on 4G networks 98.8% of the time, with no significant difference by nation or rurality. This was almost identical to the 99.0% average success rate for wifi connections.

Success rate was lower on average for 3G connections, with consumers able to access data services on average 95.8% of the time. However, it is important to note that these connections are more likely to be at the 'edge' of a network where a reliable 4G connection is not available. The same is true of 2G connections, which represented less than 1% of the total mobile records.

There were no significant differences in 4G data service availability by mobile network, but 3G connections on the Three network were more likely to succeed than those on other mobile networks.

Response time

What is response time?

Response time, referred to technically as latency, is a measure of how quickly a request for data is processed and the information sent back to the user. A connection with low latency will 'feel' more responsive and give a better experience for certain mobile activities, such as web browsing or video calling. Full breakdowns of the data can be found in our interactive report.

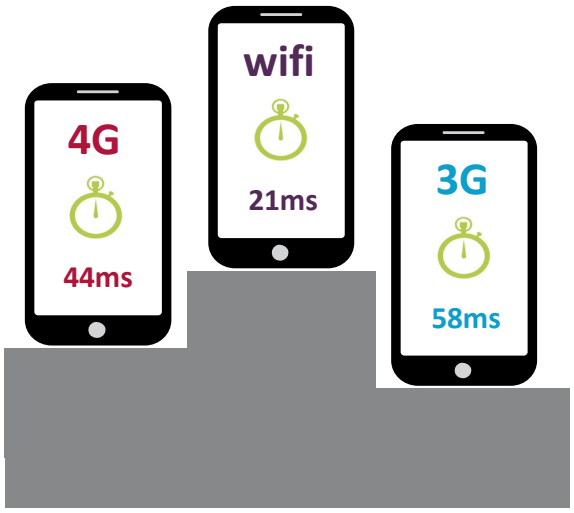
How quickly networks respond to data requests

Measured in milliseconds, the time it takes the network to respond to data requests – for example to load a web page or stream a video – can have a noticeable impact on user experience. In general, most mobile activities need a network response time under 100ms to provide a good experience, although some will perform satisfactorily with a slower response time.

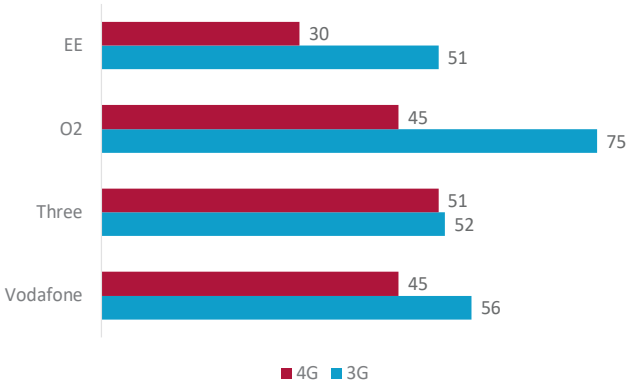
On average, wifi connections were more than twice as responsive as 4G connections, with no significant differences by rurality. Average response time on 3G networks were higher, with significant differences by rurality (62ms in rural vs. 57ms in urban areas). Looking at the data by nation, connections in England were the most responsive, while those in Northern Ireland were the least, on both 4G and 3G networks.

4G connections were fastest on the EE network and slowest on the Three network, while 3G connections were the least responsive on the O2 network.

Average response time (ms) by technology



Average response time (ms) by mobile network and network technology



Data use

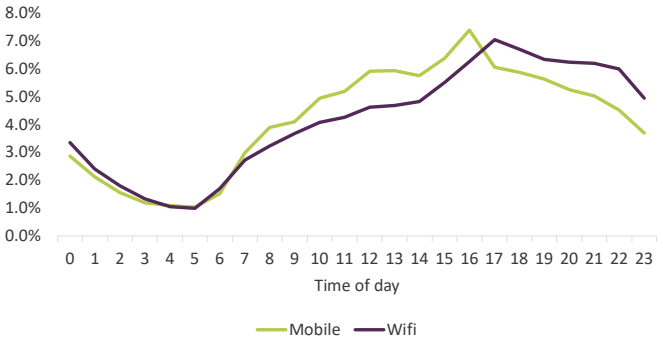
How people are using data

Our research shows that data use on mobile and wifi technologies increased steadily through the day from around 6am. The proportion of data used on cellular networks peaked between 5 and 6pm, when people were likely to be travelling home from work, while the proportion of wifi use was higher between 6 and 10pm when people were connected at home.

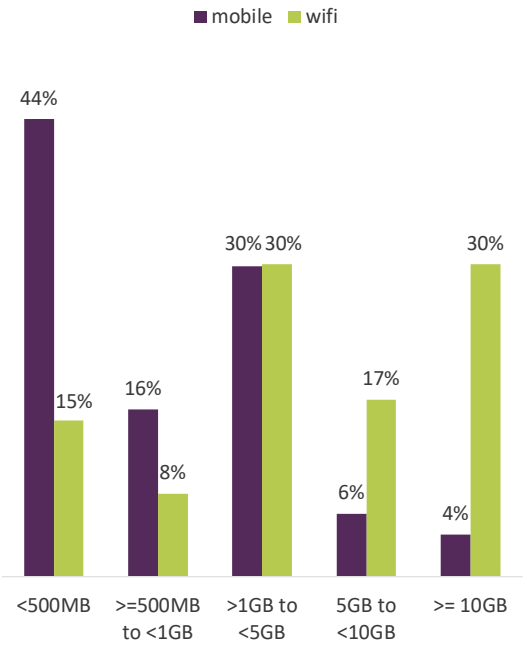
Average monthly data consumption varied significantly between panellists. Forty-four per cent of people used less than 500MB of mobile data per month, while only 10% of people used 5GB or more.

As expected, given our data on the time spent on different networks, average data use on wifi was much higher than on mobile technologies. People may also do their more data-heavy mobile activities on wifi due to their limited mobile data allowance, or lack of information on how much data certain activities use. The proportion of people with monthly data use over 5GB was almost five times higher on wifi than on mobile technologies, while the proportion of those using less than 500MB dropped by two-thirds to just 15% on wifi.

Proportion of data traffic by time of day and network technology

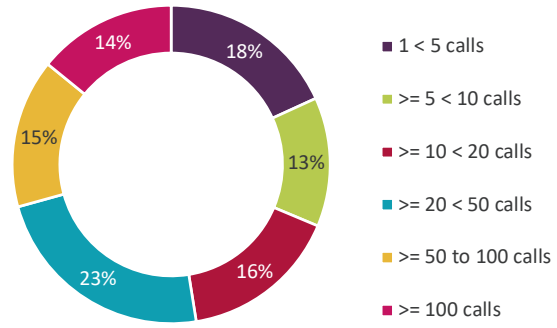


Proportion of average monthly data use per person by network technology

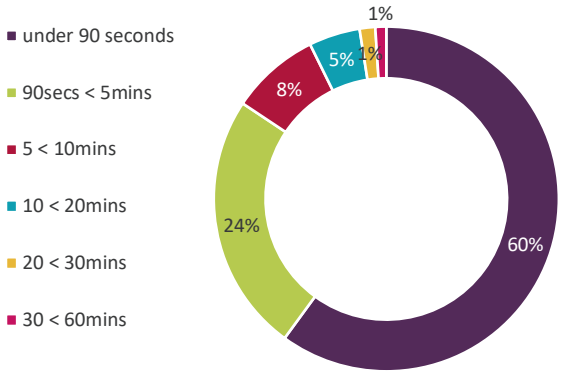


Voice call use

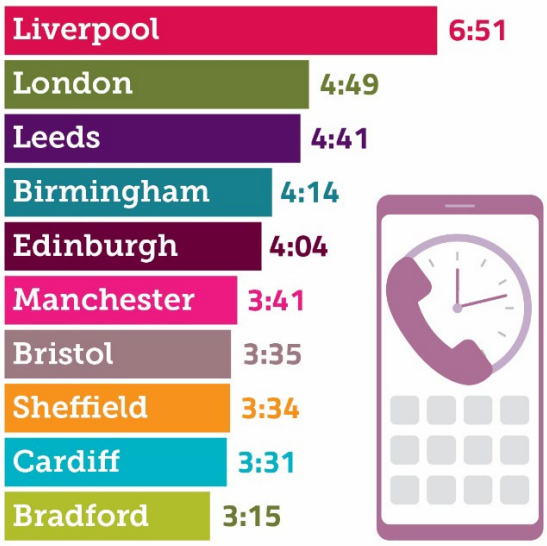
Proportion of average monthly calls made per person



Proportion of calls by average call length



Average call duration by city (mins:secs)



How people are using voice calls

Mobile voice calls remain an important means of communication for most consumers. Our crowdsourced data showed that 94% of panellists made a call during the three months of the fieldwork period, and 96% of panellists made or received a call.

The average number of outgoing calls each month varied greatly from person to person. Of those who made calls, just under a fifth made between one and five calls on average each month, meaning 24% made five or fewer calls a month. In contrast, almost a third of those who made calls made more than 50 calls per month.

However, looking at the length of these calls shows a very different picture. More than 80% of calls were shorter than five minutes, with 60% under ninety seconds, suggesting that mobile users are making frequent but relatively short calls.

The average outgoing call lasted just over four and a half minutes, with significant differences by nation, rurality and day of week. People in rural Scotland spent longer on calls than those in other rural areas, while those rural Northern Ireland had the shortest average call length overall at just over three minutes. Calls in Liverpool lasted longer than those in other cities in the dataset, at an average of just under seven minutes. Weekend calls were slightly longer on average than weekday calls, at just under five minutes compared to four and a half minutes.