TUTELA

Spain and Portugal

State of Mobile Networks

Annual Report

SEPTEMBER 2019

www.tutela.com

The past year has seen rapid change across the Spanish and Portuguese mobile industry. Not only did it see the launch of Spain's first 5G network – one of the first in Europe – but consumer habits and plans have been in flux. The price of unlimited data continues to fall(1), new plans that include over-the-top streaming services have been rolled out, and consolidation between the mobile networks of the two countries has (reportedly) accelerated(2).

In short, it's clear that there's never been a better time to own a smartphone and a data plan in Spain or Portugal. But for consumers, when it comes to picking a network, the variety of plans and perks on offer can obscure the underlying truth: a network is only good as long as it's reliable. To better understand Spain and Portugal's 3G and 4G networks, and how they perform from a consumer perspective, Tutela has collected and analyzed 281 billion measurements, including over 40 million speed tests and 649 million latency measurements, from over 3.8 million devices (iOS and Android smartphones) between February 1st and July 31st 2019.

(1) Telecompaper, Vodafone Spain cuts price of 'unlimited' mobile plans in flash offer (https://www.telecompaper.com/news/vodafone-spain-cuts-price-of-unlimited-mobile-plans-in-flash-offer--1303960)
Retrieved 5 September 2019

(2) Telecompaper, Masmovil set to expand to Portugal with stake in Nowo - report (https://www.telecompaper.com/news/masmovil-set-to-expand-to-portugal-with-stake-in-nowo-report--1305175)
Retrieved 5 September 2019

Key findings

- Movistar was the best operator in Spain, taking first place for Excellent Consistent Quality, Core Consistent Quality, and median download throughput. However, the competition was extremely fierce, and the three other Spanish operators finished within 0.1% of each other for Excellent Consistent Quality.

- Vodafone was the best operator in Portugal by some distance, taking first place for Excellent Consistent Quality by nearly 8% over second-placed MEO, and taking first place in all other categories.

- Spain finished consistently ahead of Portugal, taking first place in both Consistent Quality percentages, download throughput, upload throughput, and latency. However, on an operator level, the best networks in each country (Movistar Spain and Vodafone Portugal) offered almost identical Excellent Consistent Quality.

Results overview

TUTELA

Mobile experience results

Spain, September 2019

	movistar	orange	vodafone	yoigo
Excellent Consistent Quality	★ Winner			
Core Consistent Quality	★ Winner			
Download throughput	★ Winner			
Upload throughput			★ Winner	
Latency			★ Winner	

Results from 263,651,970,730 measurements taken in Common Coverage Areas between February 1st to July 31st 2019.

"Movistar delivered the highest percentage of Excellent Consistent Quality in Tutela's tests"

TUTELA
Best Mobile Network Experience
SEPTEMBER 2019

Based on the highest Excellent Consistent Quality in Common Coverage Areas.

Results overview

TUTELA

Mobile experience results

Portugal, September 2019

	MEO	NOS	vodafone
Excellent Consistent Quality			★ Winner
Core Consistent Quality			★ Winner
Download throughput			★ Winner
Upload throughput			★ Winner
Latency			★ Winner

Results from 13,889,953,194 measurements taken in Common Coverage Areas between February 1st to July 31st 2019.

"Vodafone delivered the highest percentage of Excellent Consistent Quality in Tutela's tests"

TUTELA
Best Mobile Network Experience
SEPTEMBER 2019

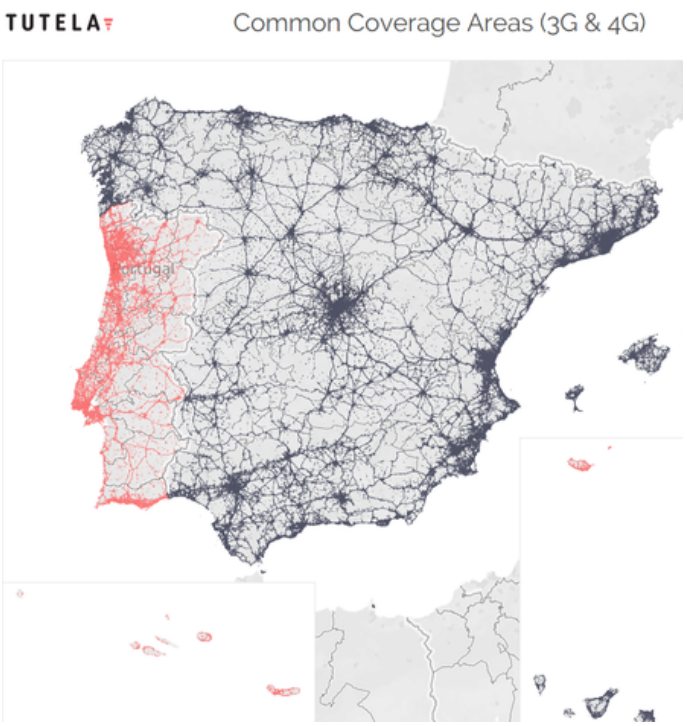
Based on the highest Excellent Consistent Quality in Common Coverage Areas.

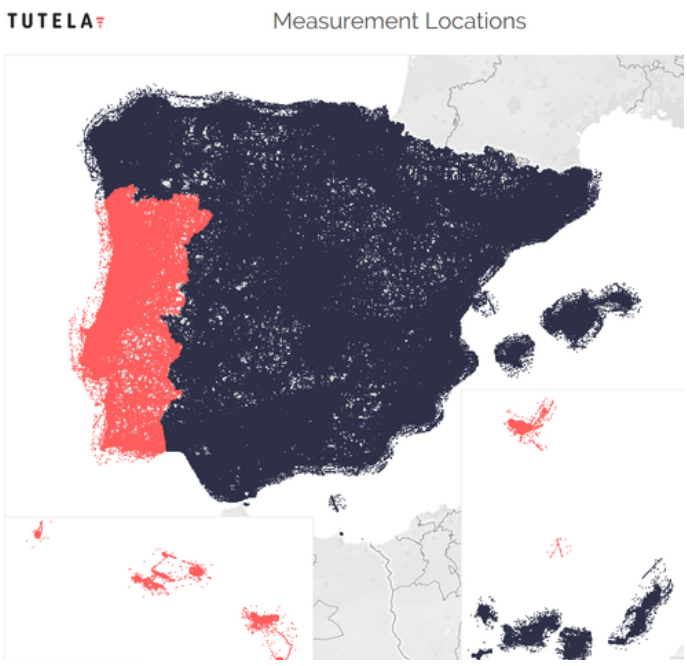
Understanding this report

Tutela uses two key methodological components to best compare user experience across operators: Consistent Quality and Common Coverage Areas. Consistent Quality is a set of metrics that Tutela has developed to objectively evaluate when networks are (and are not) enabling users to do almost everything that they want to do on their smartphones.

The methodology is covered in detail at the end of this report and on our website, but simply put, there are two sets of thresholds, Excellent and Core. A connection that hits the Excellent threshold is sufficient for use-cases like 1080p video streaming or multiplayer gaming, while a Core connection will stream standard-definition video or handle things like web browsing or uploading photos to social media. The percentages you see in this report represent the percentage of tests on a given operator that were above the Excellent or Core thresholds. These were most recently re-assessed and updated September 1st, 2019.

Common Coverage Areas are parts of the country where the majority of operators offer service. In this report, we present results nationally and from Common Coverage Areas, which helps present both a full national picture, as well as highlighting network conditions wherever operators are directly in competition.

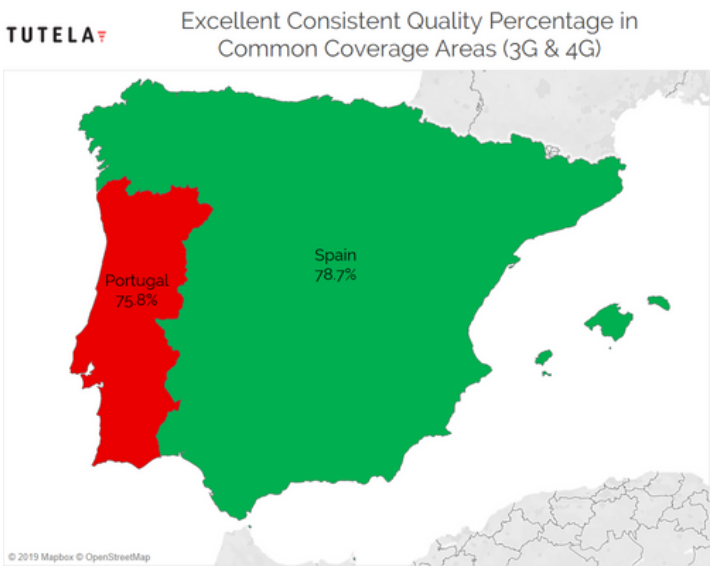




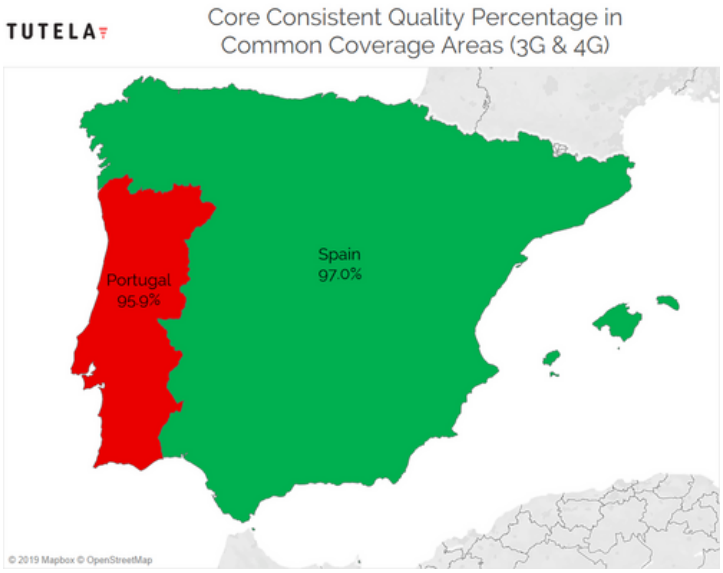
Consistent Quality

Country comparison Common Coverage Areas

Spain took a small but significant lead over Portugal for best Consistent Quality, taking first place for Excellent Consistent Quality by nearly 3%. The more demanding thresholds for Excellent Consistent Quality reflect high-end mobile use cases, such as online multiplayer gaming or streaming 1080p HD video, and Spain's higher Excellent Consistent Quality percentage indicates that when they have coverage, Spanish smartphone users are able to do those kinds of things slightly more often.



For Core Consistent Quality, it's much closer; Spain recorded a Core Consistent Quality percentage of 97.0%, compared to Portugal's 95.9%. That means that the vast majority of the time, consumers in both countries are able to use their networks for common things like SD video streaming or browsing social media.



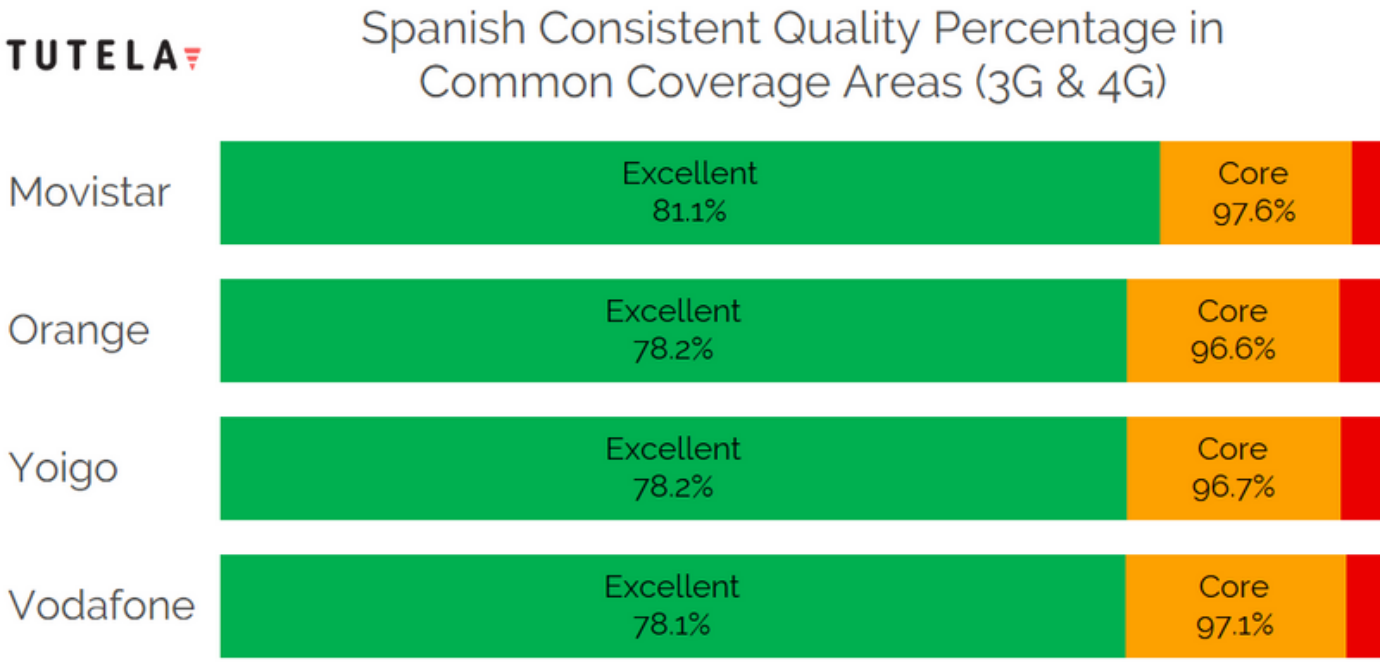
"Spain leads Portugal for Excellent Consistent Quality, with 78.7% of connections sufficient for the most demanding use-cases"

Consistent Quality

Spanish operators Common Coverage Areas

Movistar took first place for both Excellent and Core Consistent Quality, with a gap of nearly 3% between Movistar and the operators in second place. It's worth noting how tight the field was, however: tests on Orange and Yoigo exceeded the Excellent Consistent Quality percentage 78.2% of the time, with Vodafone at 78.1% - and the error margins overlap, making it a statistical tie between all three operators for second place.

In practical terms, this indicates that when consumers have service, there's little to no separation in the network performance of Orange, Yoigo, and Vodafone. Due to the relatively small footprint of Yoigo's network, it's worth noting that Yoigo customers are able to roam onto the Orange network -- which goes some way to explaining the near-identical Excellent and Core Consistent Quality results.

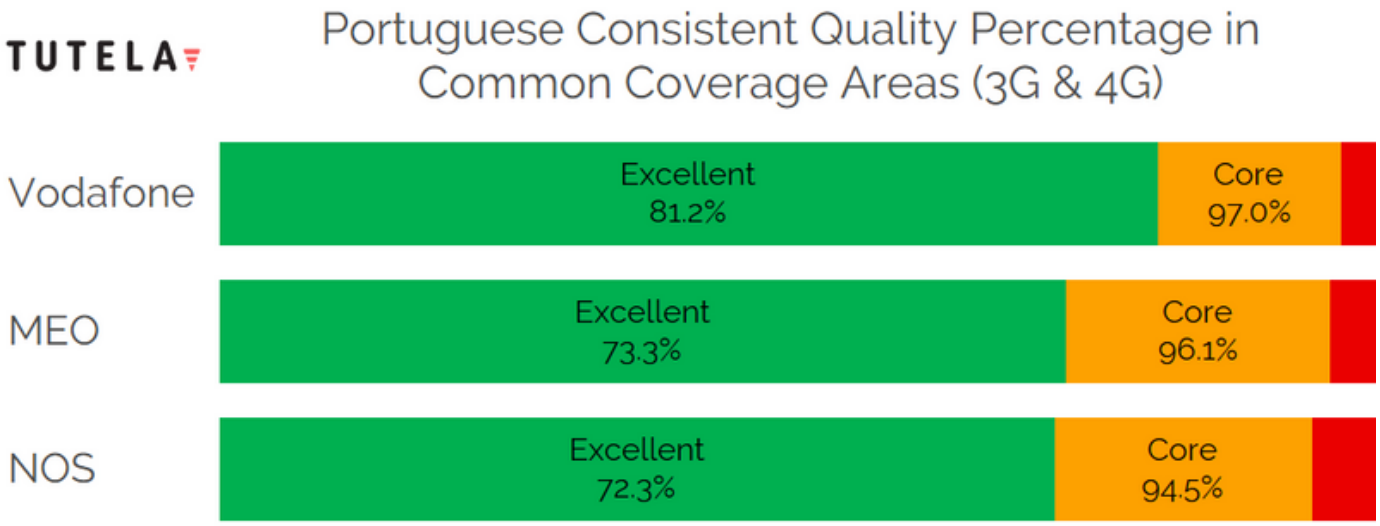


Consistent Quality

Portuguese operators Common Coverage Areas

Vodafone took a commanding first place in Portugal, with tests from Vodafone customers in Portugal surpassing the Excellent Consistent Quality thresholds 81.2% of the time. The Excellent Consistent Quality scores for MEO and NOS were lower, but still above 70%.

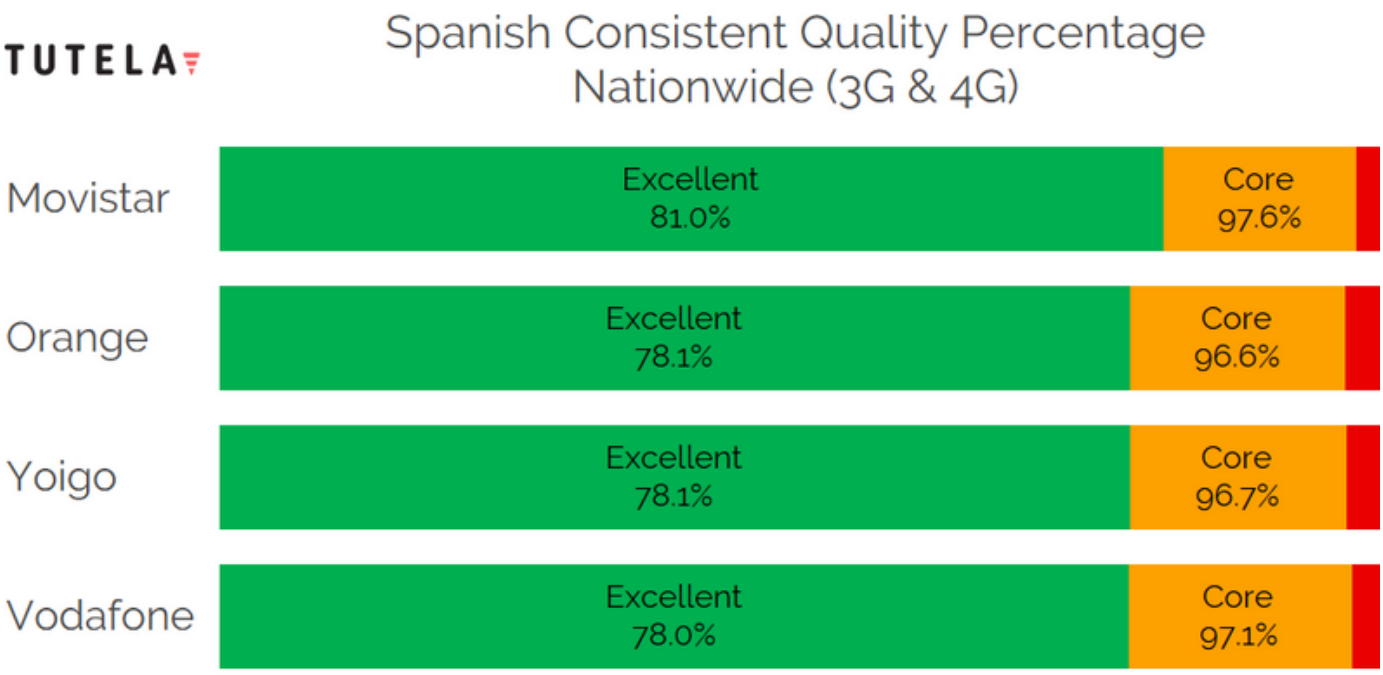
Although Vodafone also took first place for Core Consistent Quality, the competition was much closer: Vodafone had a Core Consistent Quality result of 97.0%, while MEO was less than one percentage point behind. NOS was in third place with 94.5%.



Consistent Quality

Spanish operators nationwide

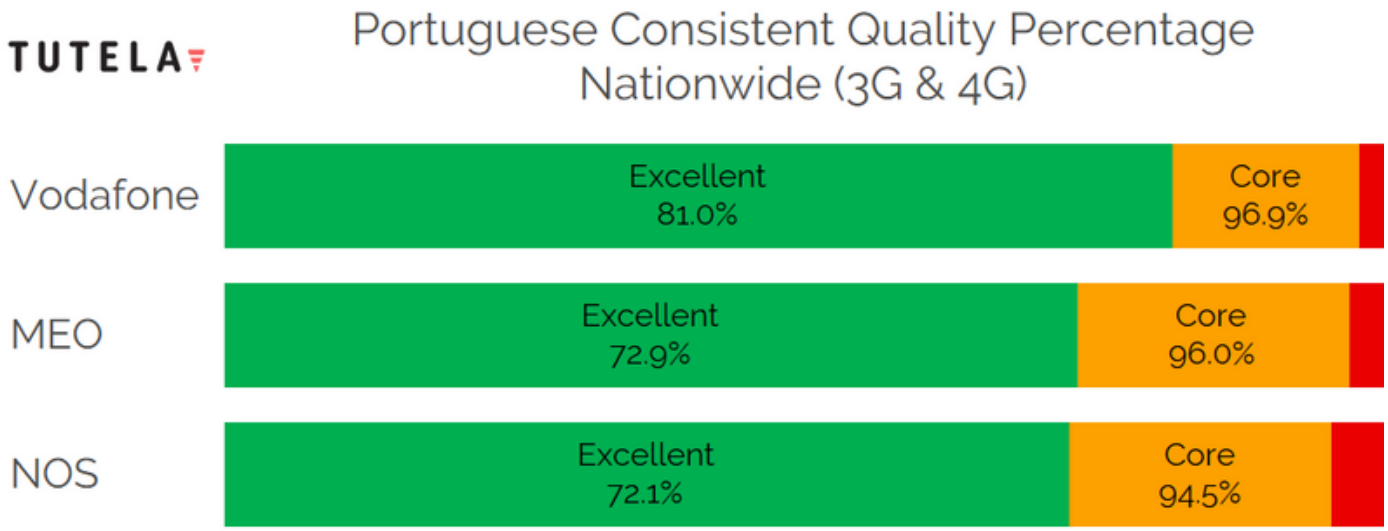
There was only minimal difference between results in Spanish Common Coverage Areas and results taken nationwide. Common Coverage Areas are those where the majority of operators offer service, and as such are places where mobile subscribers reasonably expect to have service, and operators are competing head-to-head on performance. All four operators saw a drop of 0.1% in Excellent Consistent Quality moving from Common Coverage Areas to all results taken nationally, which is to be expected -- areas outside of Common Coverage Areas are more likely to be rural, where mobile service provision is harder. However, Core Consistent Quality remains unchanged nationally, which shows that Spanish operators are providing a consistent level of baseline service nationwide.



Consistent Quality

Portuguese operators nationwide

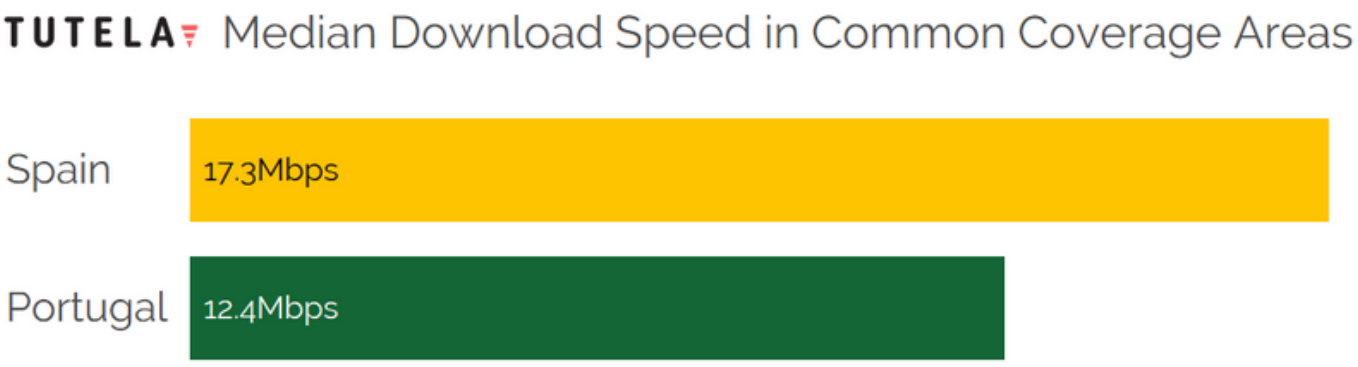
There was slightly more of a drop in the move from Common Coverage Areas to nationwide results in Portugal. Most notably, MEO's Excellent Consistent Quality percentage dropped by 0.4%, the most of any operator in this report.



Download throughput

Country comparison Common Coverage Areas

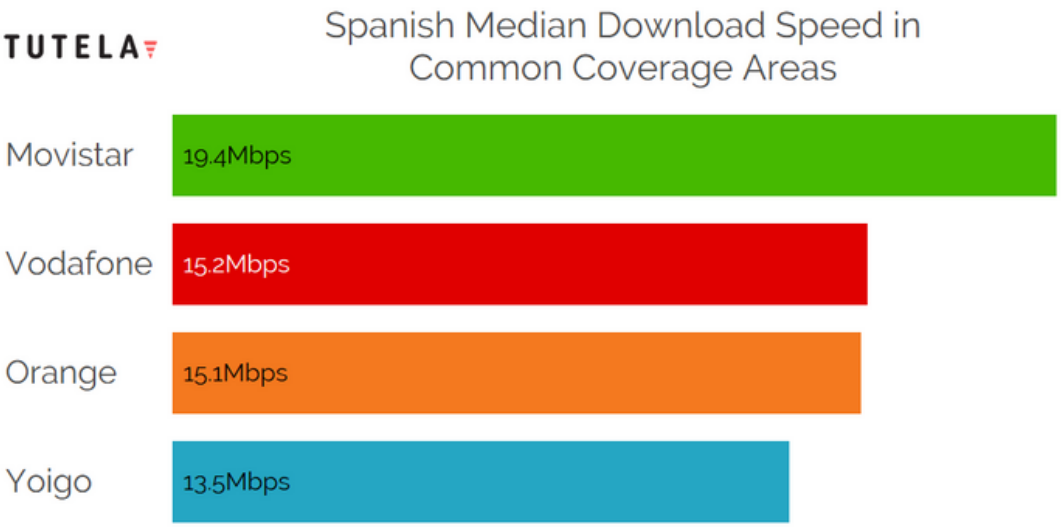
Overall, Spanish operators on average recorded a faster download throughput than Portuguese operators, thanks to the performance of operators towards the bottom of the table. The median download throughput of NOS and MEO -- around 10 Mbps -- was significantly slower than the slowest Spanish operator, Yoigo. However, it's also worth noting that all the opeators in the test recorded a median download throughput significantly faster than what's required for Tutela's Excellent Consistent Quality threshold, which reflects use-cases like 1080p video streaming. Therefore, smartphone users are unlikely to notice the difference in download performance between different operators, especially in typical day-to-day usage.

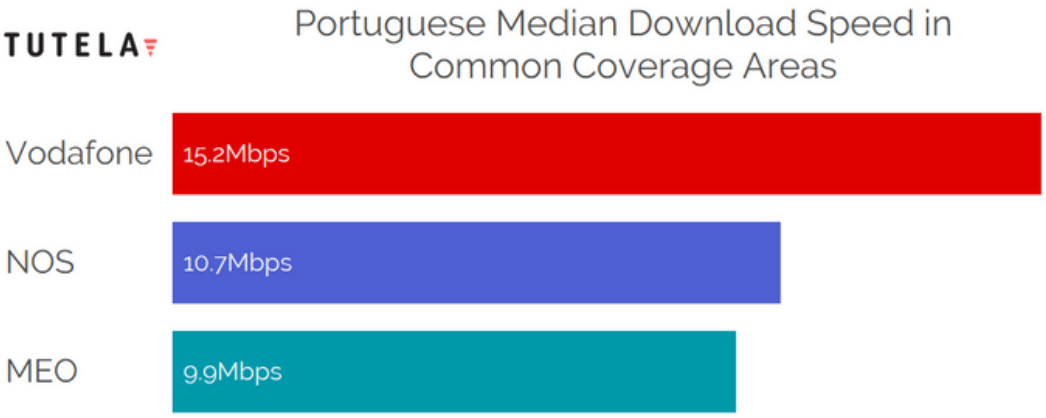


Download throughput

Spanish & Portuguese operators Common Coverage Areas

Movistar recorded the fastest median download speed in either country, with tests from its subscribers averaging at just under 20 Mbps. Vodafone was in second place, with a median of 15.2 Mbps in both Spain and Portugal. Once again, the gap between Orange and Vodafone was small -- in this case, Orange was in third place, with its median of 15.1 Mbps just 0.1 Mbps behind Vodafone. Yoigo came in fourth place in Spain, with a median download throughput of 13.5 Mbps. In Portugal, Vodafone recorded the fastest median download throughput, at 15.2 Mbps. That was nearly a full 5 Mbps better than second-place NOS. Although MEO was in second place for Excellent Consistent Quality, it came in third place for download throughput, with a median download throughput of 9.9 Mbps.

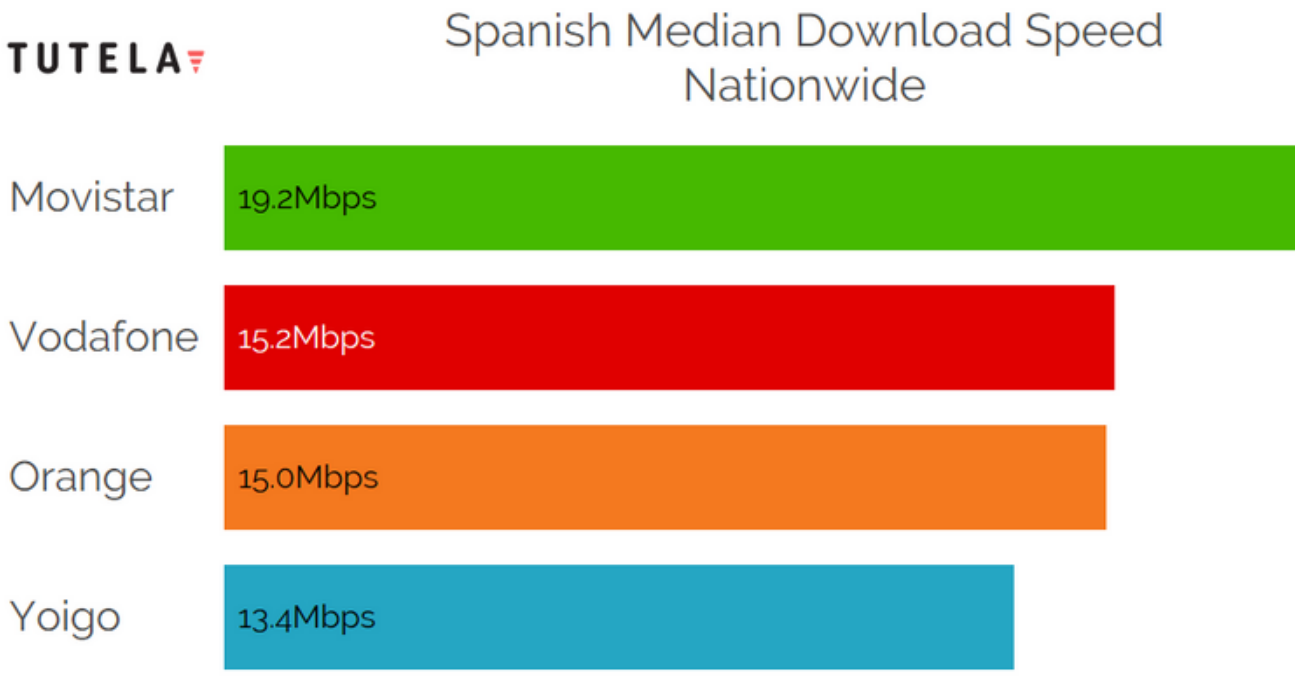


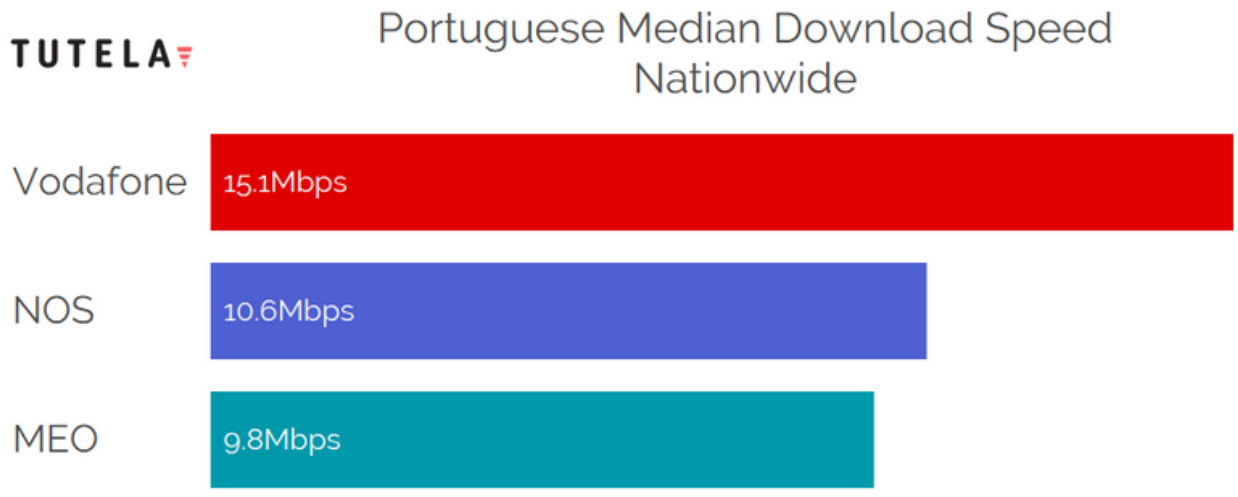


Download throughput

Spanish & Portuguese operators nationwide

There was little change from Common Coverage Areas to nationwide tests in either country. The most significant difference was a 0.2% drop in Movistar's median when moving from Common Coverage Areas to national results, suggesting that the very fastest download speeds are limited to more densely populated urban areas.

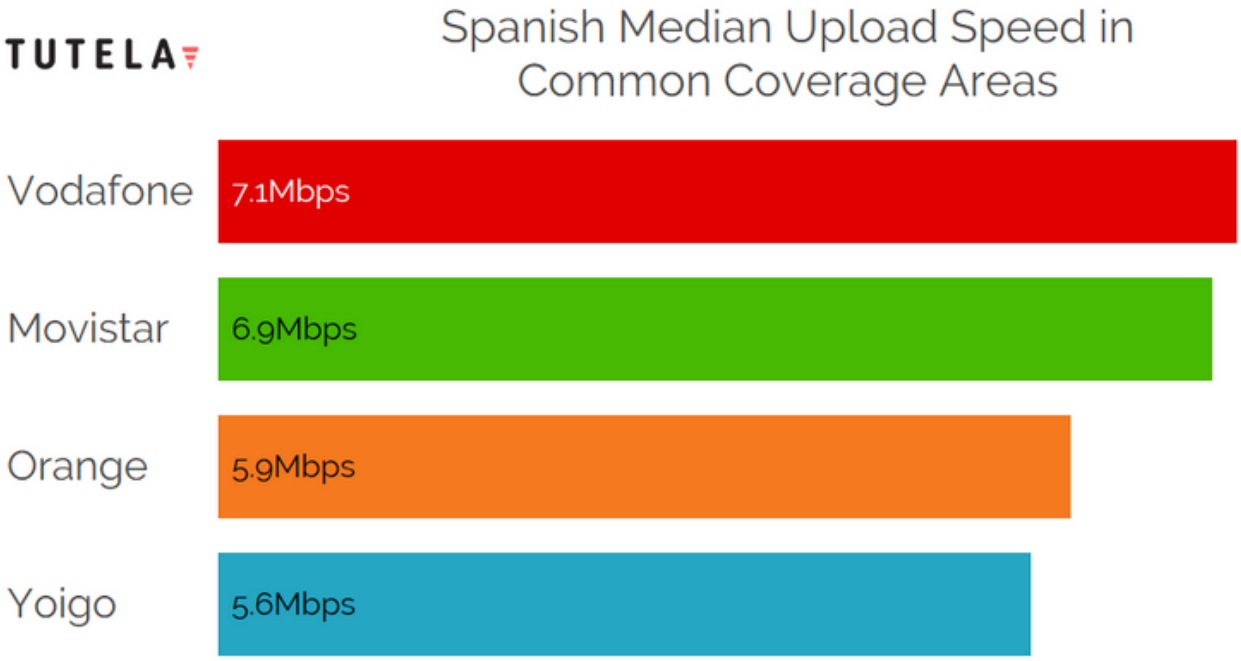




Upload throughput

Spanish operators Common Coverage Areas

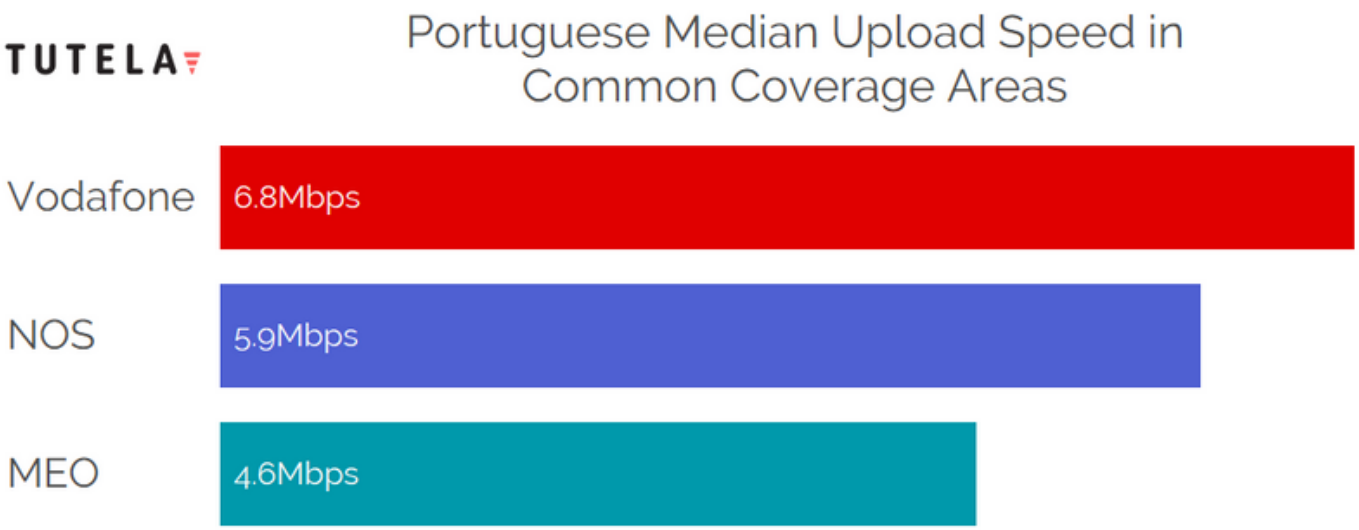
Spain's significant differences in operator performance in Consistent Quality or download throughput were nowhere to be seen when measuring upload performance. Vodafone took first place in Spain for median upload throughput, pushing Movistar into second place. However, the differences were comparatively minimal: just 1.5 Mbps separated first-place Vodafone from last-place Yoigo.



Upload throughput

Portuguese operators Common Coverage Areas

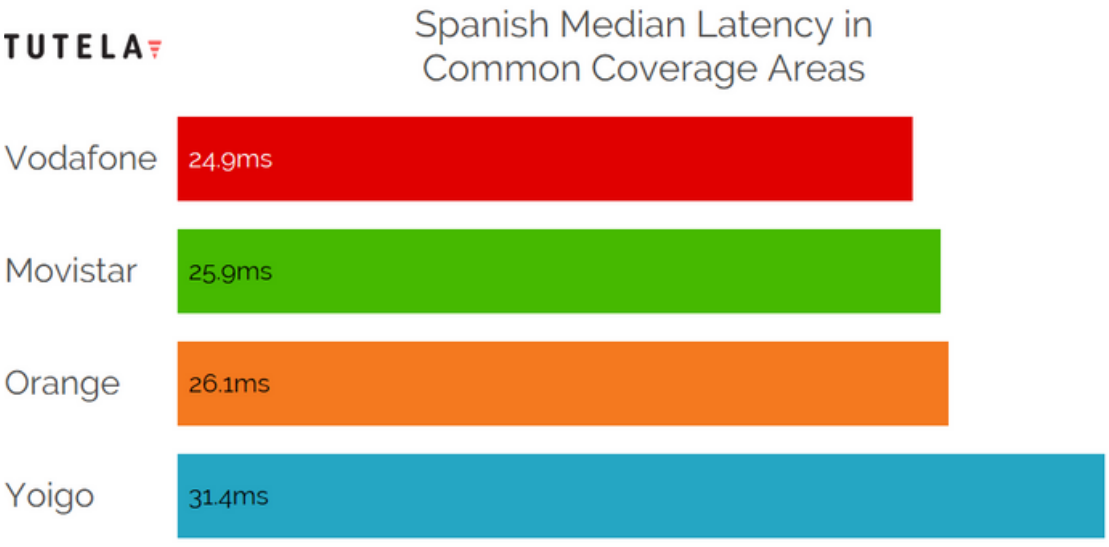
In Portugal, the differences were a little more pronounced. Vodafone was in first place, with NOS second and MEO third. For once, the gap was greater between second-place NOS and third-place MEO than between first place and second place -- while MEO and NOS recorded similar performances for Consistent Quality and download throughput, NOS and Vodafone were actually closer for upload throughput.

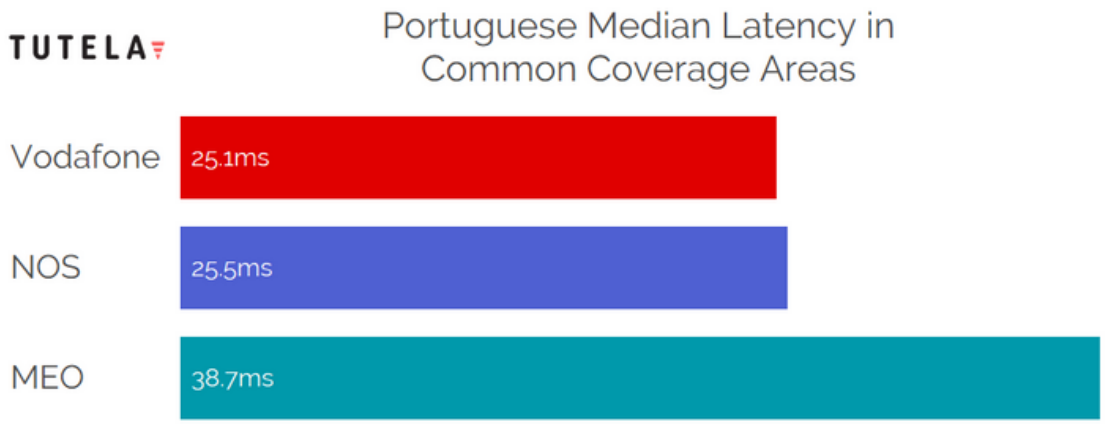


Latency

Spanish & Portuguese operators Common Coverage Areas

Vodafone took first place for latency performance in both Spain and Portugal, with very similar medians of 24.9 ms and 25.1 ms respectively. Movistar and Orange were close behind in Spain, while NOS had a median latency just 0.4 ms worse than Vodafone. Yoigo in Spain and MEO in Portugal were the outliers, with results of 31.4 ms and 38.7 ms respectively. However, it's worth noting that those medians for all operators in the test are good, and still well below the 50 ms one-way latency required for Tutela's Excellent Consistent Quality standard. Latency has a significant impact on real-time applications like multiplayer gaming or video calls, but all operators in the test are routinely providing connections that are responsive enough to handle those kinds of use-cases without any negative impact to the end user.

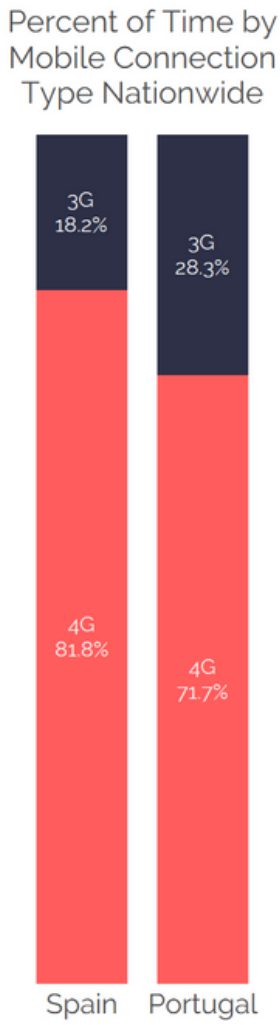


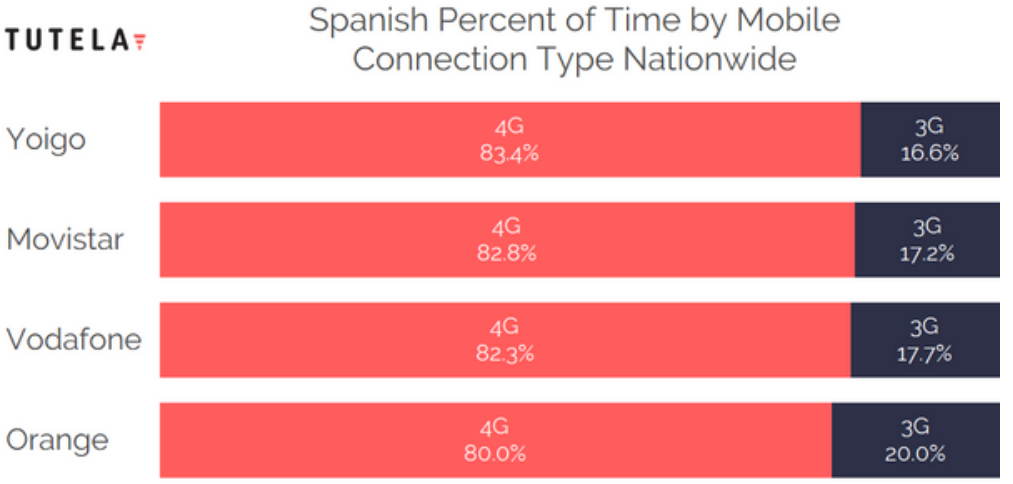


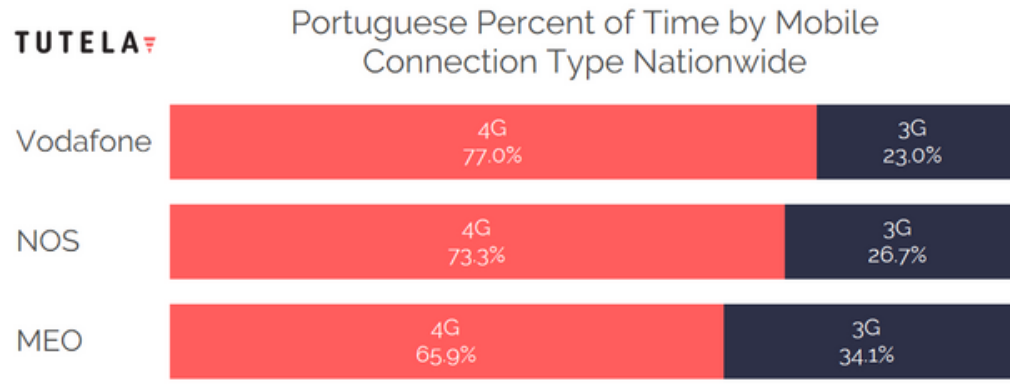
Data and spectrum usage

Spanish & Portuguese operators nationwide

Spain had a significant advantage over Portugal when it comes to 4G deployment, with Spanish smartphone users being on a 4G connection 10% more often than users in Portugal. Within the countries, however, there was little difference between operators. Yoigo customers spent the greatest proportion of time on 4G, but all Spanish operators were over 80% of time on 4G. In Portugal, Vodafone customers proportionally spend the most time on a 4G connection, at 77.0%. NOS customers come in a close second, while MEO was the only operator in the report to have subscribers spend less than 70% of their time on a 4G connection.





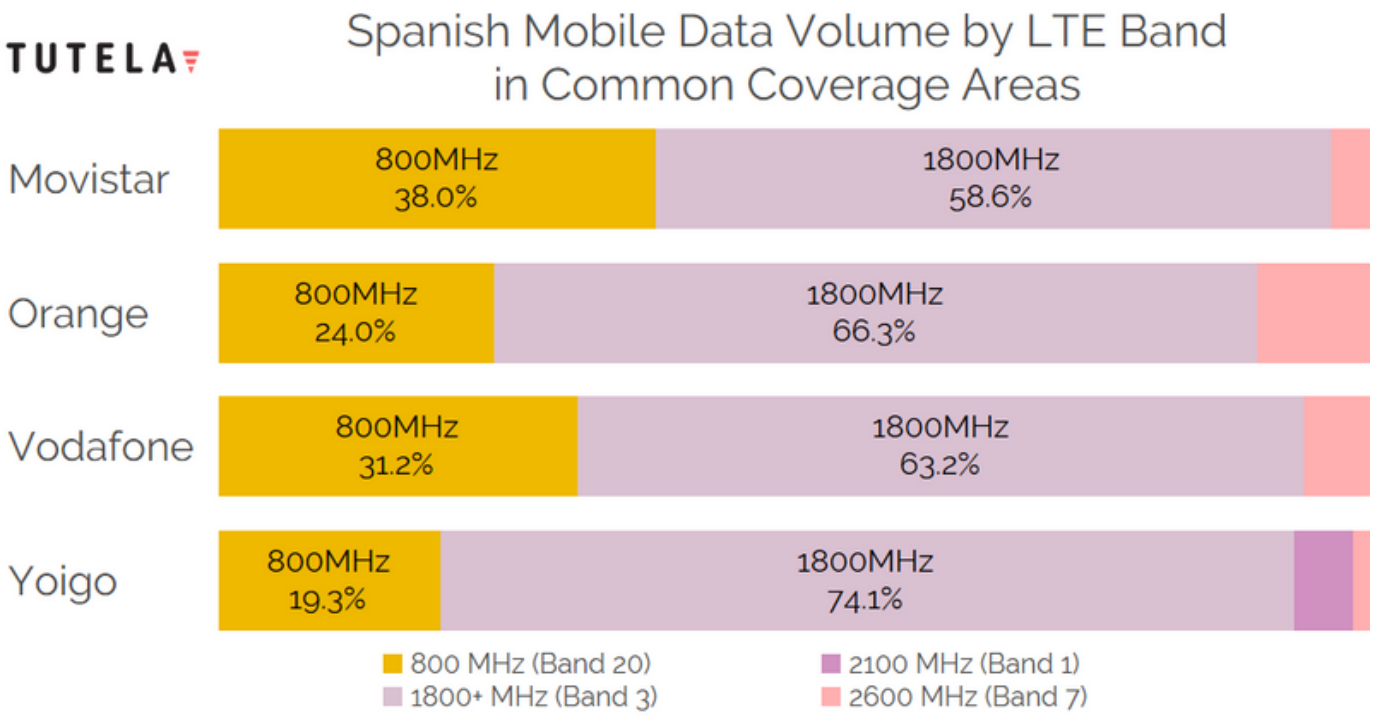


Data and spectrum usage

Spanish operators Common Coverage Areas

When it comes to spectrum utilization, operators in both countries use a mix of 800 MHz and 1800 MHz spectrum to handle the majority of data traffic. Networks also use a mixture of 2100 MHz and 2600 MHz high-band spectrum to help out in densely-populated areas. Lower-band spectrum travels further and penetrates buildings better, and as such provides the best coverage.

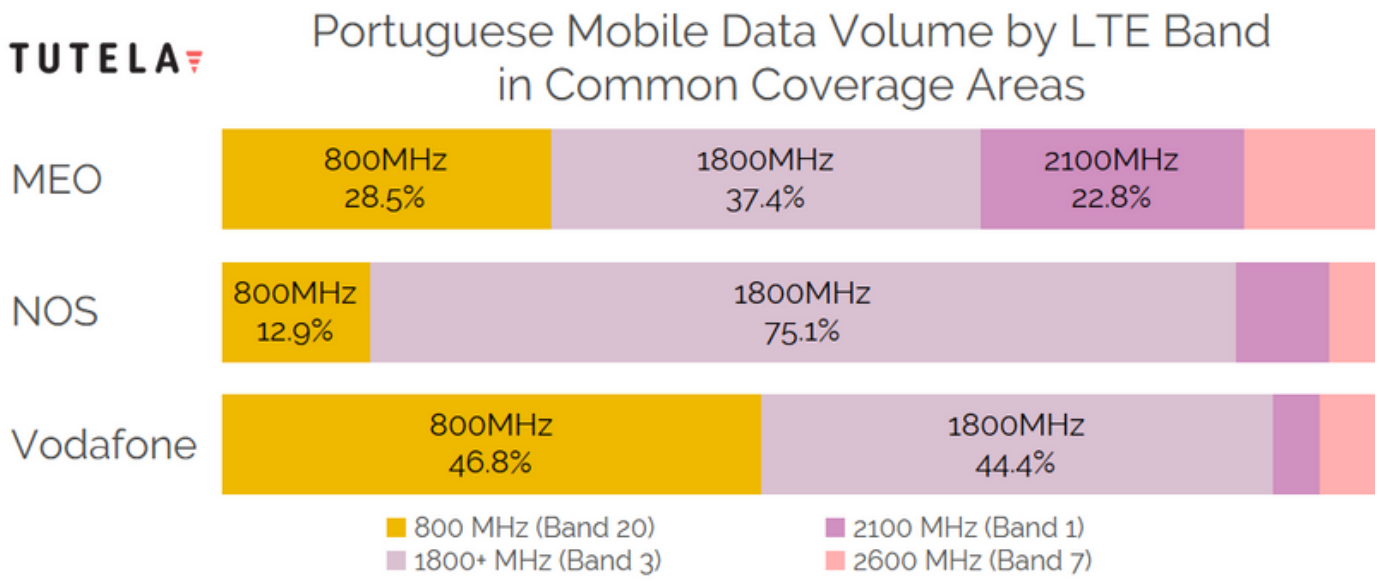
In Spain, Yoigo stands out as using the 800 MHz spectrum for the lowest proportion of its traffic, instead relying on 1800 MHz and 2600 MHz spectrum.



Data and spectrum usage

Portuguese operators Common Coverage Areas

In Portugal, MEO is the only operator to use 2100 MHz and 2600 MHz for a significant proportion of its traffic. However, in both countries, the amount of 800 MHz spectrum available is limited, and as a result capacity has to be found elsewhere. With the exception of Yoigo, all operators have 20 MHz of 800 MHz spectrum available for 4G. Utilizing that limited bandwidth more heavily can create capacity and congestion problems; operators that succeed in diversifying their spectrum utilization end up with a more balanced network(3).



(3) Tutela, The roll of spectrum in Spain's 5G future https://www.tutela.com/blog/spain-5g-rollout-date-spectrum-auction Retrieved 5 September 2019

Methodology

Tutela is an independent crowdsourced data company with a global panel of over 300 million smartphone users. We gather information on mobile infrastructure and test wireless experience, helping organisations in the mobile industry to understand and improve the world's networks.

Tutela collects data and runs network tests via software embedded in a diverse range of over 3,000 consumer applications, which enable the measurement of real-world quality of experience for mobile users, 24/7. For this report, we gathered 281,559,204,519 measurements, including over 40 million speed tests and 649 million latency measurements, from more than 3.8 million devices (iOS and Android smartphones) between February 1st and July 31st 2019.

Tutela measures network quality based on the real-world performance of actual network subscribers, inclusive of occasions when a network or tariff may be throttled or congested. Results in this report are based on a testing configuration designed to represent the typical (rather than maximum) performance that users experience. We use a 2 MB file to perform our download testing and a 1 MB file to perform our upload testing. Latency performance in this report reflects one-way UDP latency. Tests are conducted against the same content delivery networks that power many of the world's most popular consumer applications, and as such reflect the end-to-end performance of the network.

Consistent Quality

Download speed is most often used as a proxy for network quality, but while download throughput is important, it's just one of several crucial requirements for a "good" connection.

As operators have upgraded 3G networks to LTE-Advanced technology, theoretical (and even real-world) peak throughput speeds have increased to where they vastly outstrip the maximum needed for any current use-case. Real-world speeds above 100 Mbps are now common in parts of the world, and with a 4K video stream -- which itself is rarely something smartphone users need -- using a fifth of that, average download speed has lost some of its relevance as the dominant statistic used to measure the quality of wireless networks.

At its most basic, a good connection is one that doesn't get in the way of users doing what they want to do. In the real world, smartphone users aren't running speed tests all day -- they're browsing the web, using apps, voice calling their friends, streaming Netflix and YouTube, or making video calls.

Consistent Quality

To more objectively evaluate when networks are (and are not) enabling users to do those things, Tutela has developed a standard called consistent quality. Simply put, it's two sets of thresholds, called Excellent and Core. If a connection hits the Excellent standard, it's sufficient for the most demanding mobile use-cases, like HD group video calling or 1080p video streaming. A Core connection is good enough for SD video streaming, web browsing, emails, and VOIP calling, but users are more likely to experience delays or buffering when trying to use more demanding apps. Tutela bases the threshold values on the minimum performance requirements published by popular apps. We most recently updated our Consistent Quality thresholds on September 1st, 2019.

Tutela's consistent quality metric, as used in our reports, simply measures the percentage of time that users can hit the thresholds. The higher the number, the more often users have a Core or Excellent quality connection.

Excellent Quality

KPI	Download throughput	Upload throughput	Latency	Jitter	Packet loss
Minimum acceptable value	5 Mbps	1.5 Mbps	50 ms	30 ms	1%

Core Quality

KPI	Download throughput	Upload throughput	Latency	Jitter	Packet loss
Minimum acceptable value	1.5 Mbps	500 Kbps	100 ms	50 ms	5%

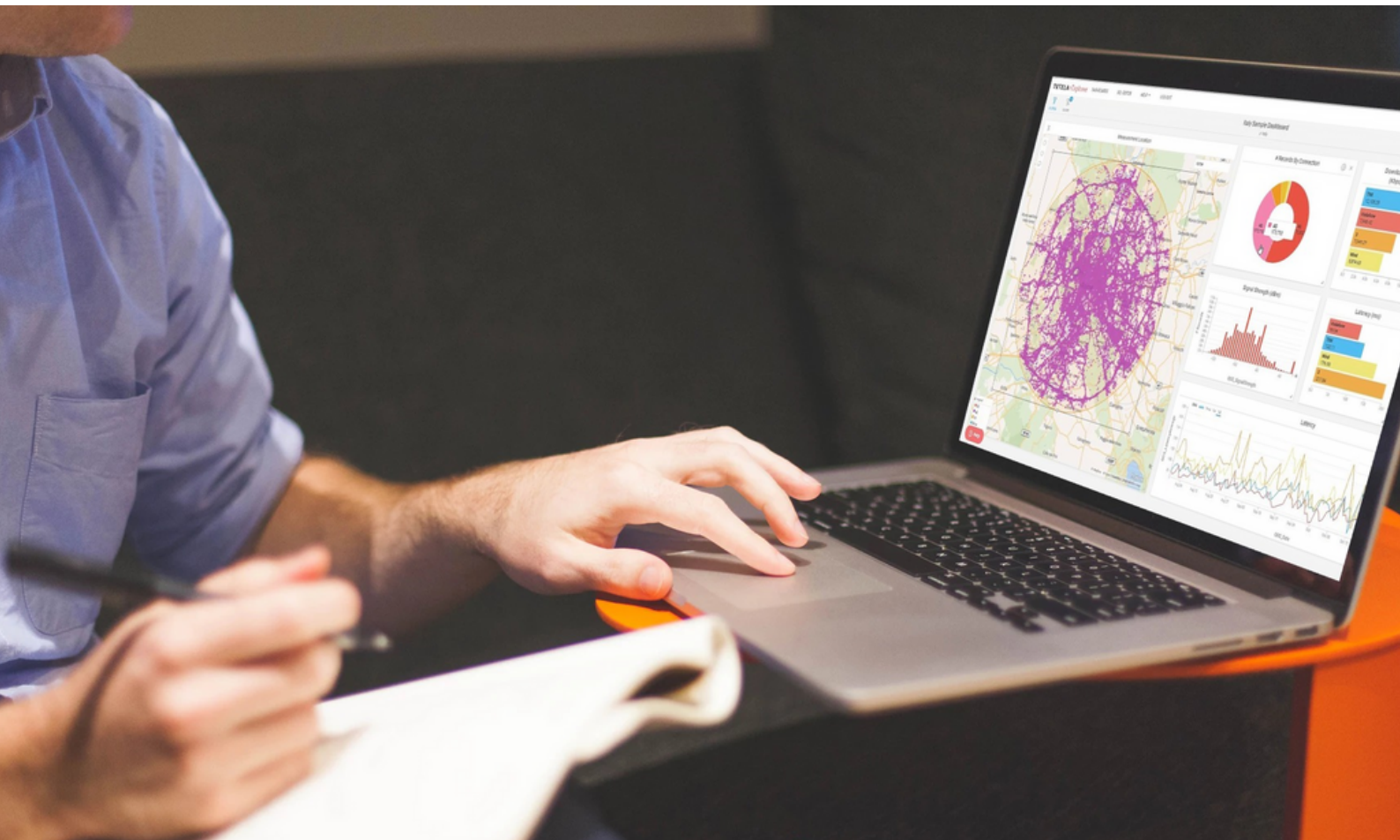
Discover Tutela Explorer

Tutela Explorer is a powerful cloud-based solution for real-time analysis of crowdsourced data. Using the platform, mobile operators can:

- Create coverage and quality maps
- Benchmark network quality and coverage across all operators
- Drill down to any KPI at city, street or even building level
- Analyse spectrum utilisation, performance and more

Visit www.tutela.com/explorer to learn more

Learn more



Appendix

TUTELA

Error Margins

		Download Median	Upload Median	Latency Median	Excellent CQ	Core CQ
Common Coverage Areas	Movistar	±0.04Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	Orange	±0.03Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	Vodafone Spain	±0.03Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	Yoigo	±0.02Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	MEO	±0.04Mbps	±0.02Mbps	±0.01ms	±0.3%	±0.0%
	NOS	±0.07Mbps	±0.04Mbps	±0.01ms	±0.3%	±0.0%
	Vodafone Portugal	±0.09Mbps	±0.04Mbps	±0.01ms	±0.2%	±0.0%
National	Movistar	±0.05Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	Orange	±0.03Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	Vodafone Spain	±0.03Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	Yoigo	±0.02Mbps	±0.01Mbps	±0.00ms	±0.1%	±0.0%
	MEO	±0.04Mbps	±0.02Mbps	±0.01ms	±0.3%	±0.0%
	NOS	±0.07Mbps	±0.04Mbps	±0.01ms	±0.3%	±0.0%
	Vodafone Portugal	±0.09Mbps	±0.03Mbps	±0.01ms	±0.2%	±0.0%
		Download Median	Upload Median	Latency Median	Excellent CQ	Core CQ
Common Coverage Areas	Spain	±0.02Mbps	±0.00Mbps	±0.01ms	±0.0%	±0.0%
	Portugal	±0.05Mbps	±0.02Mbps	±0.04ms	±0.1%	±0.0%

About Tutela

Tutela Technologies, Ltd., is an independent crowdsourced data company with a global panel of over 300 million smartphone users. It gathers information on mobile infrastructure and tests wireless experience, helping organizations in the mobile industry to understand and improve the world's networks. Data and insights provided by Tutela are trusted by the engineering teams at mobile network operators and network equipment manufacturers around the world and used to compare operators as well as inform decisions in network and infrastructure planning and optimisation. The organization is headquartered in Victoria, British Columbia.

Tutela does not collect any sensitive personal data and is compliant with international privacy regulations including GDPR.

For further information about the methodology, data and tools used to create this report, please contact analysis@tutela.com or visit www.tutela.com.

Follow us