



June 2022

# Trans-Tasman comparison report on performance of selected broadband services

In 2017, the Australian Competition and Consumer Commission (ACCC) launched its project to measure internet performance. SamKnows was appointed to supply their Whiteboxes to internet users in Australia to measure the performance of NBN fixed-line internet.

In 2018, the New Zealand Commerce Commission (NZCC) appointed SamKnows to measure New Zealand's internet performance as part of a programme called Measuring Broadband New Zealand.

This is the first joint report that aims to present performance data for selected comparable broadband services offered in Australia and New Zealand. The findings presented in this report are derived from data collected between 1st September and 30th September 2021.

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# Overview

The purpose of this report is to present performance data for three selected comparable broadband products between Australia and New Zealand in terms of broadband speed and access technology. This report analyses and compares measurement data recorded in the two countries during September 2021.

The first type of product included in this report are 100/20 megabits per second (Mbps) fixed-line plans: Australia's NBN 100/20 over fibre to the premises (FTTP) and hybrid fibre coaxial (HFC) connections and New Zealand's Fibre 100 (offered over FTTP connections only).<sup>1</sup>

The second type of product included in this report are very high speed plans: Australia's NBN Ultrafast plan over FTTP and New Zealand's Fibre Max plan, which are the fastest plans tested in both countries. It is noted that NBN Ultrafast plans are also available over HFC, whose New Zealand equivalent would be the HFC Max plan. However, cable coverage in New Zealand is limited to certain areas only<sup>2</sup>, and in September this service was subject to network performance issues. Because of this, a comparison of very high speed HFC plans is not included in this report.<sup>3</sup>

The third type of product included in this report are fixed wireless plans: Australia's NBN Fixed Wireless Plus plan, offered over NBN's Fixed Wireless Access Services, and New Zealand's fixed wireless plans offered over their 4G Fixed Wireless Access Service.

In both Australia and New Zealand, broadband is also offered over copper (ADSL and VDSL), and fixed wireless broadband over 5G. These were not chosen to be compared in this report for a variety of reasons: some products differed in how they were offered in each country ('best efforts' vs speed tiers), were not within the scope of both countries' programs, or the data collected in the September testing window was insufficient for a comparison.

<sup>1</sup> While New Zealand has HFC available in some areas, there are no HFC plans in New Zealand that offer speeds of 100/20 Mbps. It is also noted that since September 2021, the majority of New Zealand services on the Fibre 100 plan have been upgraded to a 300/100 Mbps plan.

<sup>2</sup> As at September 2021, areas where HFC is available are Wellington, Upper & Lower Hutt, the Kapiti Coast and parts of Christchurch.

<sup>3</sup> Measuring Broadband New Zealand Spring Report 2021, [https://comcom.govt.nz/\\_data/assets/pdf\\_file/0026/271961/MBNZ-Spring-Report-2021-01-December-2021.pdf](https://comcom.govt.nz/_data/assets/pdf_file/0026/271961/MBNZ-Spring-Report-2021-01-December-2021.pdf).

# Market structure

## Australia

In Australia, the National Broadband Network (NBN) is a government initiative to upgrade Australia's broadband infrastructure to provide consumers with fast broadband connections. NBN Co is responsible for building and maintaining the NBN.

The current model for the NBN incorporates a variety of broadband technologies. As at September 2021, 1.6 million premises were connected via NBN FTTP with 2.4% on Home Ultrafast, and 2 million premises were connected via NBN HFC. Around 18% of FTTP and HFC subscribers had download speeds of 100 Mbps in September 2021. Fixed wireless technology served 373,000 premises. The remaining 4.4 million premises were connected via copper-based technologies.<sup>4</sup> NBN Co is progressively offering consumers on copper-based technologies the option to upgrade to FTTP.<sup>5</sup>

## New Zealand

New Zealand's Ultra-Fast Broadband (UFB) initiative is a New Zealand Government policy to provide New Zealand consumers with access to fibre broadband. The programme established several local fibre companies, of which Chorus is the largest.

New Zealand consumers have the choice of fibre, fixed wireless, HFC or copper-based connections (ADSL & VDSL), with the number of copper connections declining rapidly. Following the extension of the UFB programme, more than 1.8 million households and businesses, or 87% of New Zealanders should have the ability to connect to fibre by the end of 2022.<sup>6</sup> As at 30 September 2021, 1,180,766 households and businesses were connected to fibre, with 67% of those on 100 Mbps connections, and 19% on Fibre Max connections.<sup>7</sup>

As at 30 September 2021, 308,000, or 17% of New Zealand premises were connected to the internet via copper technologies and 276,493, or 15% of New Zealand premises were connected to fixed wireless.

<sup>4</sup> ACCC NBN Wholesale market indicators report, September 2021, available at: <https://www.accc.gov.au/regulated-infrastructure/communications/national-broadband-network-nbn/nbn-wholesale-market-indicators-report/september-quarter-2021-report>.

<sup>5</sup> NBN Co media release: <https://www.nbnco.com.au/corporate-information/media-centre/media-statements/nbn-co-offers-further-fibre-upgrades-as-part-of-four-and-half-billion-plan>

<sup>6</sup> Commerce Commission New Zealand, Annual Telecommunications Monitoring Report 2021, 17 March 2022, available at: [https://comcom.govt.nz/\\_data/assets/pdf\\_file/0019/279100/2021-Annual-Telecommunications-Monitoring-Report-17-March-2022.pdf](https://comcom.govt.nz/_data/assets/pdf_file/0019/279100/2021-Annual-Telecommunications-Monitoring-Report-17-March-2022.pdf), page 5.

<sup>7</sup> Crown Infrastructure Partners, Connectivity Quarterly Update September, available at: [https://www.crowninfrastructure.govt.nz/wp-content/uploads/CIP-Connectivity-Quarterly-Update-September-2021\\_FINAL.pdf](https://www.crowninfrastructure.govt.nz/wp-content/uploads/CIP-Connectivity-Quarterly-Update-September-2021_FINAL.pdf).

## Metrics used in this report

This report compares New Zealand and Australia across a number of metrics. A summary of what these metrics are and how they are calculated is provided in the table below.

	Test	Definition
	Download	The speed at which data can be transferred from the SamKnows test server to your computer, measured in megabits per second (Mbps).
	Upload	The speed at which information is transferred from your computer to the SamKnows test server, measured in megabits per second (Mbps).
	Latency	How long it takes a data packet to go from your device to our test server and back to your device, measured in milliseconds (ms). The shorter the latency, the better.
	Packet loss	Packet loss counts packets that are sent over a network and don't make it to their destination, measured as a percentage of packets lost out of all packets sent.
	Outages	The outages metric tracks how many times per day your broadband connection goes offline for at least 30 seconds. Outages between 12am and 5am are excluded from this metric as this is when network maintenance typically occurs.
	Video streaming	Measures the highest bitrate (in Mbps), and therefore quality level, you can reliably stream from real content servers.

# Key results<sup>8</sup>

## Fixed-line 100/20 Mbps plans

Australian NBN 100/20 Mbps plans over FTTP + HFC compared to NZ Fibre 100/20 Mbps plans.

### Australia

Download  
**100.2 Mbps**

Upload  
**18.2 Mbps**

Outages  
**1.1 per week**



### New Zealand

Download  
**100.3 Mbps**

Upload  
**22.3 Mbps**

Outages  
**0.9 per week**



## Very high speed fibre plans

Australian NBN Ultrafast over FTTP compared to NZ Fibre Max plans.

### Australia

Download  
**745.6 Mbps**

Upload  
**45.7 Mbps**

Outages  
**0.9 per week**



### New Zealand

Download  
**808.1 Mbps**

Upload  
**507.2 Mbps**

Outages  
**0.5 per week**



## Fixed wireless plans

Australian NBN Fixed Wireless plus over 4G compared to NZ Fixed Wireless over 4G.

### Australia

Download  
**36.4 Mbps**

Upload  
**4.0 Mbps**

Outages  
**1.3 per week**



### New Zealand

Download  
**29.2 Mbps**

Upload  
**17.0 Mbps**

Outages  
**4.2 per week**



<sup>8</sup> Download and upload speeds measured during busy hours (7pm-11pm Monday-Friday), outage rates measured during all hours.

# Fixed-line 100/20 Mbps plans

In this section we compare the performance of two 100/20 Mbps plans: the Fibre 100 plan of New Zealand and the NBN 100/20 plan of Australia over FTTP and HFC connections. As noted above, there is not a 100 Mbps HFC service in New Zealand, so it was not chosen for this comparison.

It is important to note that although these services are each specified with a download speed of 100 Mbps, over-provisioning the downlink is permitted in each of Australia and New Zealand. This practice recognises that a certain proportion of a customer's plan speed is given over to protocol overhead, which is key to ensuring that communications are delivered to the right place. The overprovisioning of the download and the upload component means that consumers can more reliably experience speeds that are closer to the maximum set download speed of their chosen retail plan speed. Although 100/20 plans are overprovisioned in both countries, the level of overprovisioning is different. Australia's NBN Co overprovisions the downlink by 10-15%, meaning that the theoretically attainable maximum download speed is 115 Mbps in Australia. However, NBN Co does not overprovision the uplink. In contrast, while New Zealand's services are generally overprovisioned on both the downlink and the uplink, the amount of overprovisioning is up to the individual RSPs rather than a fixed percentage as is done in Australia.

## Download speeds

Figure 1 compares the download speeds attained by services on Australia's NBN 100/20 plans (over FTTP and HFC connections) and New Zealand's Fibre 100 plans.

Data collected during busy hours (defined as 7-11 pm on Monday-Friday in both countries) and outside of busy hours is presented separately.

Figure 1 also includes the "busiest hour" download speed for both plans. This metric aims to capture the extent to which performance is affected when the network is under the highest levels of stress, and is calculated as the fifth-lowest hourly average download speed across busy hours in September 2021.

Figure 2 shows the smoothed hourly download speeds averaged across the month for every hour when measurements are scheduled.<sup>9</sup> Missing data points indicate that measurements are not scheduled to take place in that hour.

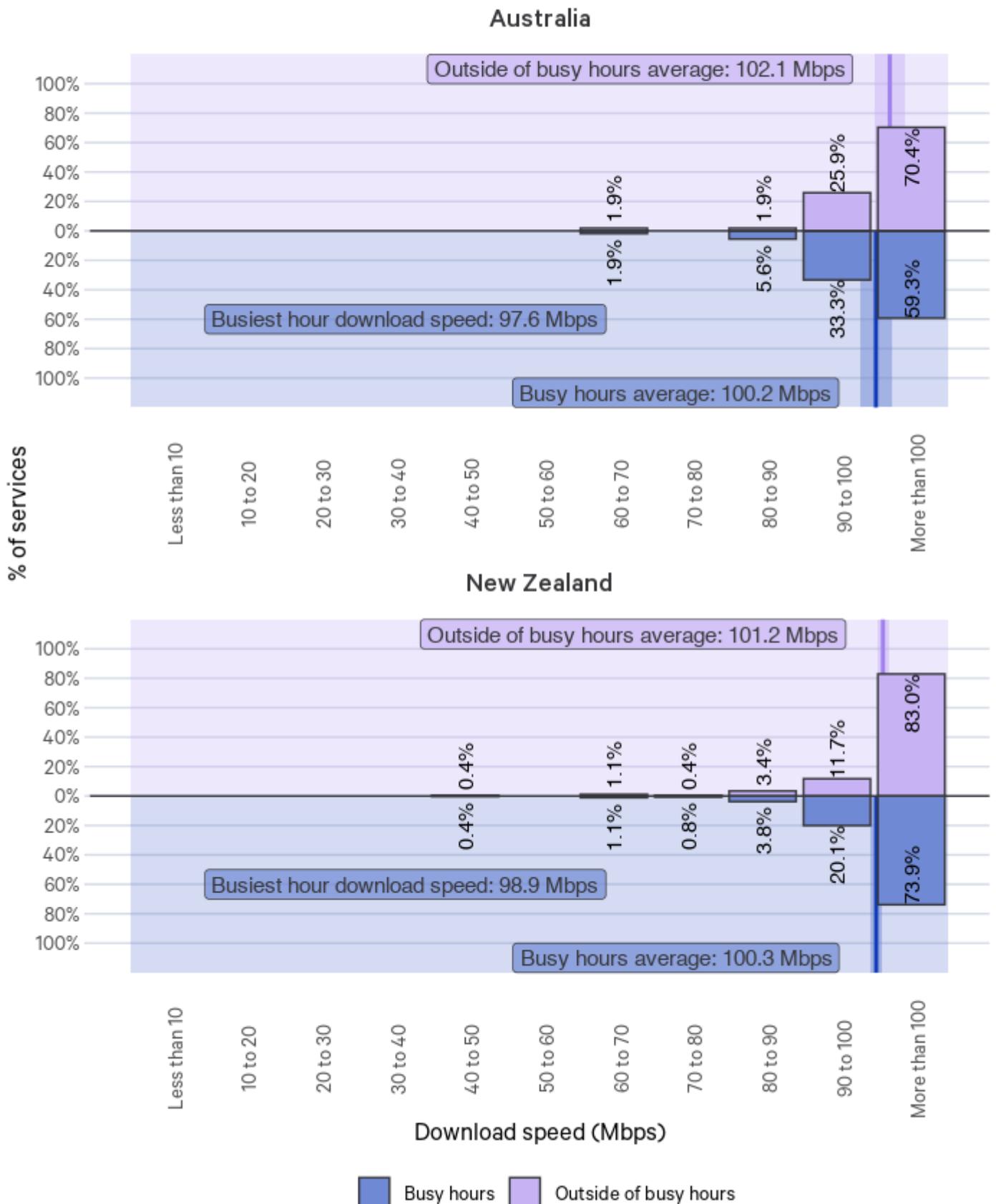
<sup>9</sup> In Australia, download tests are scheduled to take place once every 6 hours between midnight and 6pm, and hourly between 6pm and midnight. In New Zealand, download tests are scheduled to take place once every 6 hours between midnight and 6pm, and hourly between 7pm and 11 pm - thus there are no download tests scheduled to take place between 6pm-7pm and 11pm-midnight in New Zealand.

## Figure 1: Distribution of download speeds for NBN 100/20 and Fibre 100 plans

Higher download speed is better. Busy hours are Monday - Friday, 7pm - 11pm.

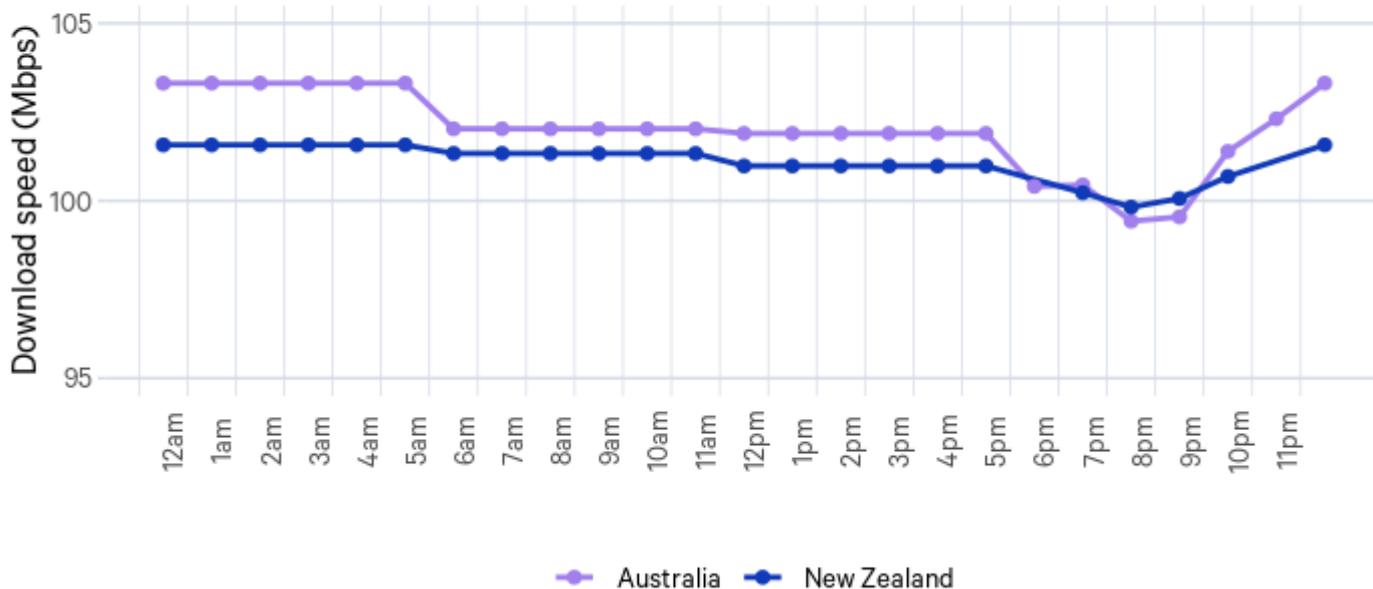
Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



**Figure 2: Average hourly download speed for NBN 100/20 and Fibre 100 plans**

Higher download speed is better.



### Key observations

- Comparing Australia’s NBN 100/20 Mbps plans supplied over FTTP and HFC to New Zealand’s Fibre 100 plan, average download speeds are similar (see Figure 1).
- Despite the higher level of overprovisioning in Australia for download speeds (15% against New Zealand’s approximately 10%), the percentage of households attaining average download speeds above 100 Mbps is higher in New Zealand than in Australia both during and outside of busy hours (see Figure 1).
- The hourly results for both countries show a decrease during 7pm - 11pm (see Figure 2). This decrease is driven by the increased traffic during busy hours (7pm - 11pm on Monday Friday).
- The busiest hour download speed (quoted in Figure 1) in both countries is slightly lower than the average download speed during busy hours. This indicates that there were periods of higher-than-usual demand in both countries that had a small effect on download performance.
- The lowest speeds are measured during 8pm - 9pm in both countries (see Figure 2). The NBN 100/20 plan shows a greater variation in download speeds during the day than Fibre 100.

## Upload speeds

Figure 3 compares the upload speeds attained by services on Australia’s NBN 100/20 plans (over FTTP and HFC connections) and New Zealand’s Fibre 100 plans.

Data collected during busy hours and outside of busy hours is presented separately.

### Figure 3: Distribution of upload speeds for NBN 100/20 and Fibre 100 plans

Higher upload speed is better. Busy hours are Monday - Friday, 7pm - 11pm. Bars show the distribution of household averages. Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- Australia's NBN 100/20 Mbps plans are not overprovisioned on the uplink. As a result, the measured average upload speeds remain under 20 Mbps. In contrast, almost all households on New Zealand's Fibre 100 attain average upload speeds that exceed the nominal 20 Mbps due to overprovisioning on the uplink.

## Latency

Average round trip latency is the average time required to send a packet of data to the test server and back. Lower latency will result in more responsive behaviour from real-time applications such as video conferencing and online gaming.

Figure 4 compares round trip latencies of Australia's NBN 100/20 plans (over FTTP and HFC connections) and New Zealand's Fibre 100 plans.

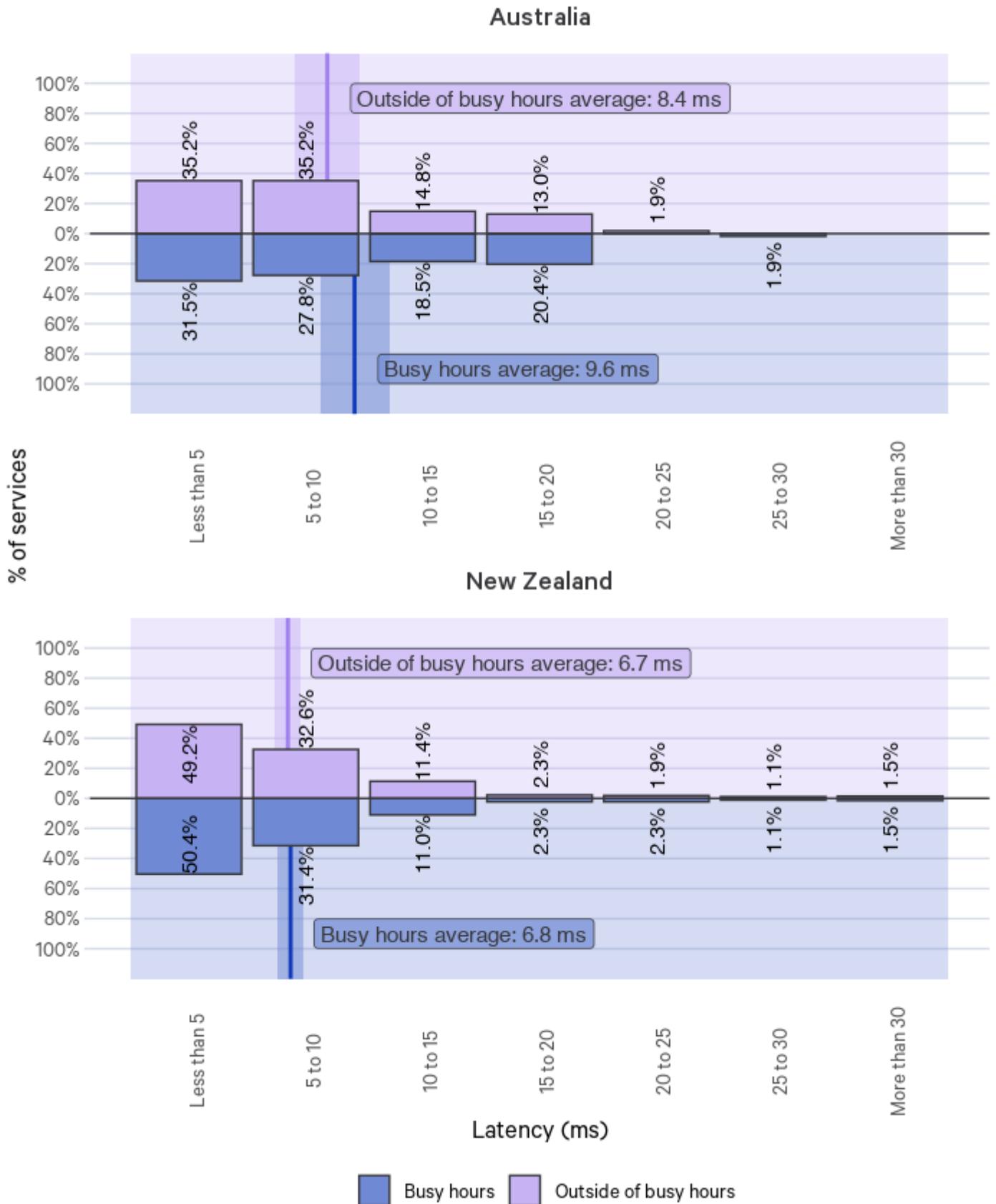
Data collected during busy hours and outside of busy hours is presented separately.

## Figure 4: Distribution of latencies for NBN 100/20 and Fibre 100 plans

Lower latency is better. Busy hours are Monday - Friday, 7pm - 11pm.

Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- Around 95% of NBN 100/20 and Fibre 100 services experience latency of 20 ms and under, both during and outside of busy hours. Latency at this level provides very good support for the normal operation of most end-user applications.
- That said, Fibre 100 had a lower average latency than NBN 100/20, and latency increased more during busy hours on NBN 100/20 than on Fibre 100.

## Packet loss

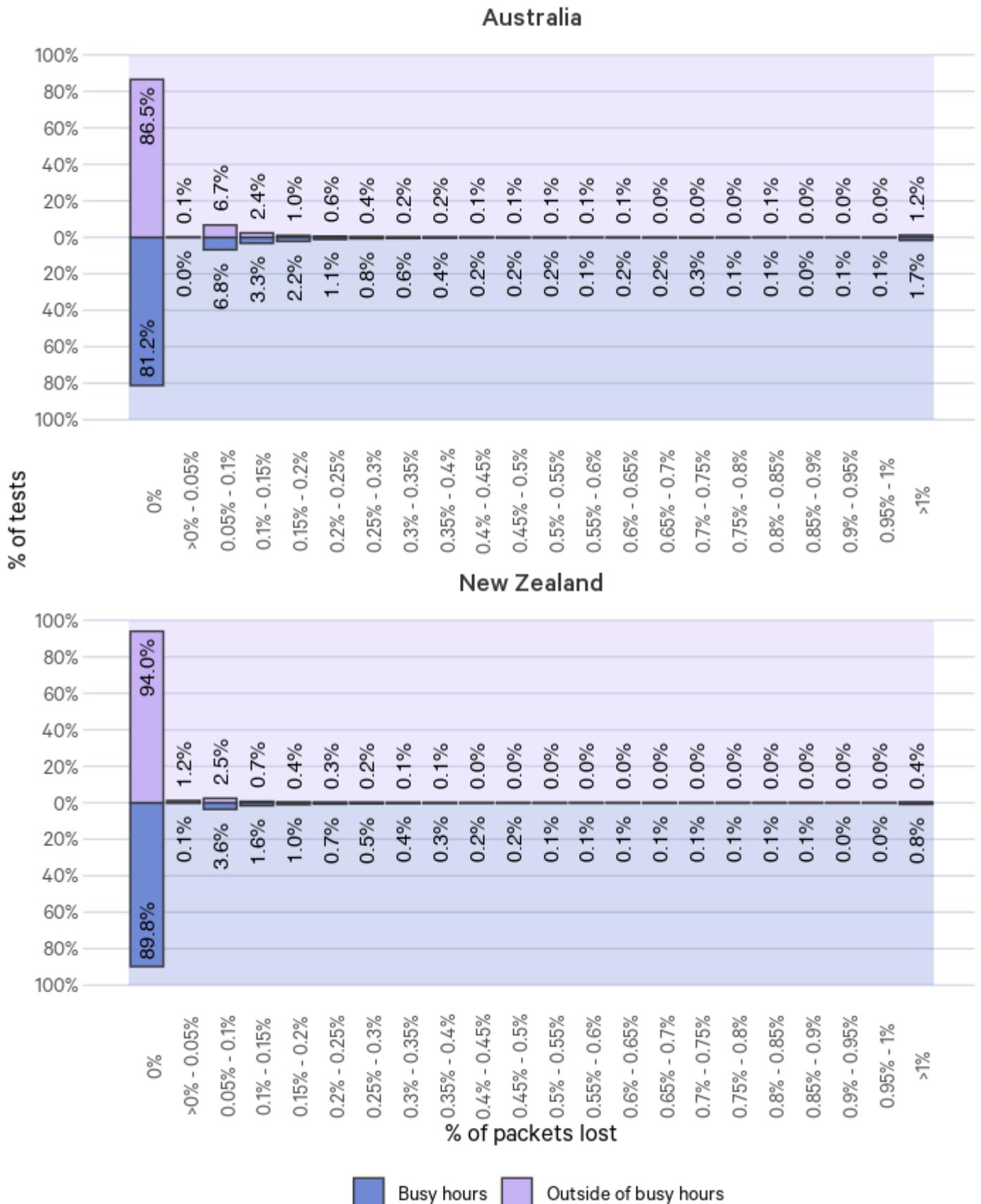
Packet loss measures the percentage of packets that were lost somewhere between the router and the test server, often due to network congestion. Packet loss is expressed as a percentage of all packets sent.

Figure 5 compares the distribution of average household packet loss rates for Australia's NBN 100/20 plans (over FTTP and HFC connections) and New Zealand's Fibre 100 plans.

Data collected during busy hours and outside of busy hours is presented separately.

**Figure 5: Distribution of packet loss rates for NBN 100/20 and Fibre 100 plans**

Lower packet loss is better. Busy hours are Monday - Friday, 7pm - 11pm. Bars show the distribution of household averages.



## Key observations

- The proportion of households having an average rate of packet loss above 1% is higher in Australia. At this level of packet loss, some end-user applications will not run as intended.
- The proportion of households having an average rate of packet loss above 1% increases during busy hours in both countries.

## Outages

The impact of outages on the consumer depends on both the frequency of outages as well as the duration of outages. For example, a less regular outage but one that lasts more than 10 minutes may be more disruptive to a consumer than outages that occur slightly more often but are less than a minute in length. How disruptive outages are will depend on the consumer, how they use their home broadband connection and the time of day that the outage occurs.

The following chart shows the weekly rate of outages. An “outage” in this context is any disconnection lasting longer than 30 seconds that happens between 5am and midnight.<sup>10</sup> The number of such outages suffered by services during the reporting period is then divided by the number of days on which the Whitebox would have been able to report the occurrence of disconnections to get an average daily rate of outages. Because the average daily rate of outages is quite low in both countries, the charts show the weekly rate of outages (the average daily outages multiplied by 7). The overall averages noted in the figures are trimmed averages to account for the presence of outliers.

Figure 6 compares the distribution of outage frequencies for Australia’s NBN 100/20 plans (over FTTP and HFC connections) and New Zealand’s Fibre 100 plans.<sup>11</sup>

Data is shown for all hours.

<sup>10</sup> It is assumed that outages shorter than 30 seconds have a less significant impact on the consumer. Data from the midnight-5am period is excluded because this is typically when network maintenance takes place to cause minimal disruption to the consumer.

<sup>11</sup> It is noted that while this report uses the same dataset as was used for the Measuring Broadband Australia Report 15 and the Measuring Broadband New Zealand Spring Report 2021, outage rates are presented slightly differently in the two reports. Similarly to the Australia Report, this chart only includes outages lasting longer than 30 seconds.

## Figure 6: Distribution of outage frequencies for NBN 100/20 and Fibre 100 plans

Lower outage frequency is better.

Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- When comparing New Zealand's Fibre 100 plans to Australia's NBN 100/20 Mbps plans over FTTP and HFC, the rate of outages was found to be very low in both countries. At an average rate of one or fewer outages per week, outages are unlikely to have an impact on user experience, although it is worth noting that in both countries a few services experience considerably higher rates of outages at more than one outage per day.

## Streaming services

Another key part of the consumer's broadband experience is the quality of experience when using streaming services. Specific tests were run to two major content providers, Netflix and YouTube. Figures 7 and 8 show the results of these tests for Australia's NBN 100/20 plans (over FTTP and HFC connections) and New Zealand's Fibre 100 plans.

Figure 7 shows the proportion of NBN services on the main NBN plans which would be able to reliably stream (without stopping and starting) a varying number of videos from Netflix simultaneously. A High Definition video stream from Netflix would take up around 2.2 Mbps data rate on average. An Ultra High Definition (4K) video stream would take up 12 Mbps on average. The actual data rate will vary during video streaming; for example Netflix would use a higher data rate during a fast-paced action scene. It will also depend on Netflix's user traffic at a given time. The Whitebox measures the total downstream data rate available from Netflix's servers, and so using multiples of 2.2 Mbps (for High Definition) and 12 Mbps (for Ultra High Definition) allows us to infer whether a service would be able to handle different numbers of streams. This assumes no other use of the connection at the time i.e. that Netflix is the only application running.

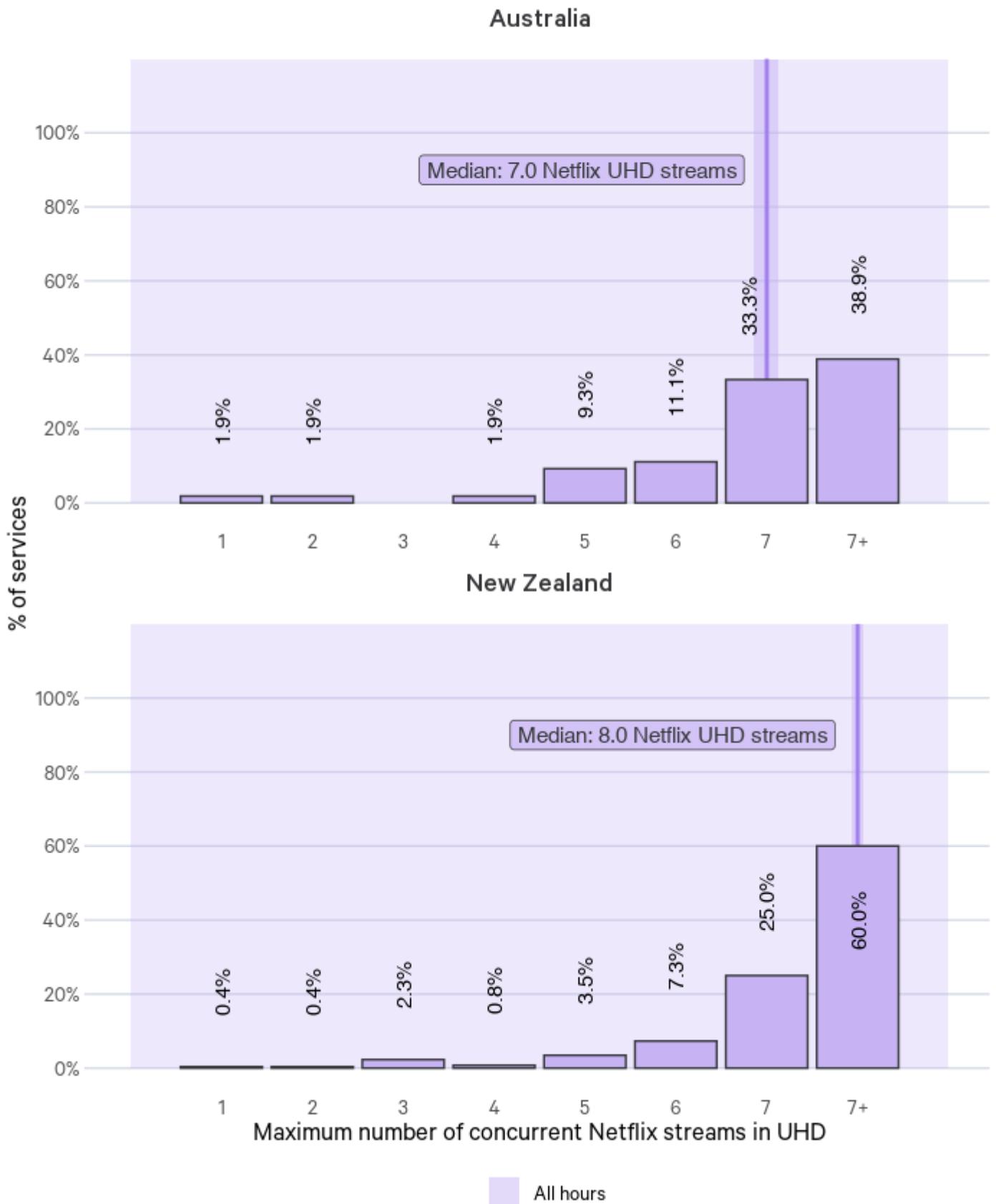
Figure 8 shows the proportion of content available in UHD quality from YouTube. The test for YouTube is similar to the Netflix test. Since YouTube caps the data rate at which it serves video, test results could not be used to infer whether a service would be able to handle multiple concurrent streams.

Nevertheless, nearly all tests from all NBN plans were able to stream YouTube reliably in Ultra High Definition. Figure 9 shows the proportion of YouTube content that could be streamed in Ultra High Definition for the 100/20 plans.

Data is shown for all hours.

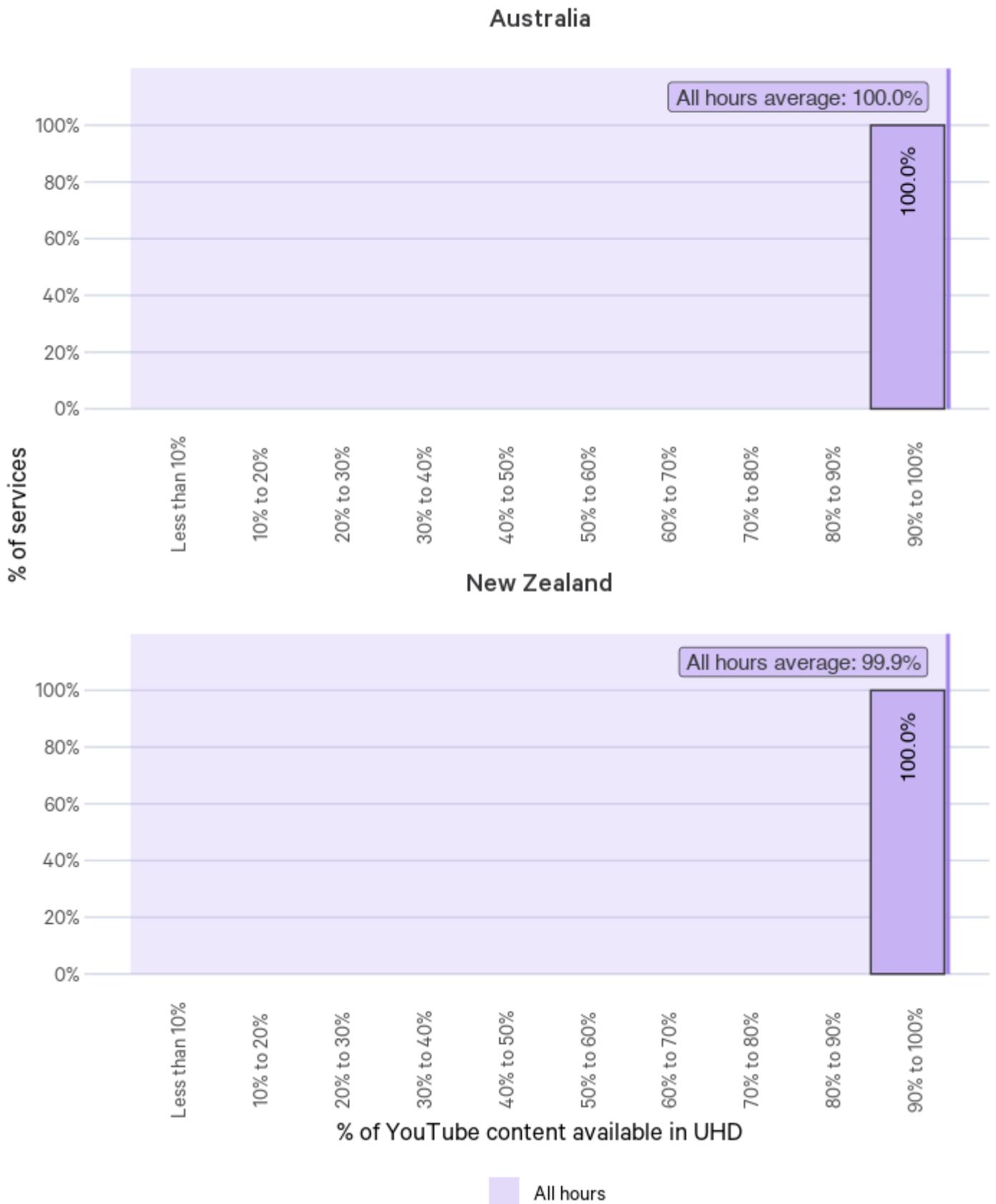
**Figure 7: Maximum number of concurrent Netflix UHD streams supported by NBN 100/20 and Fibre 100 plans**

Higher number of UHD streams is better.  
 Bars show the distribution of household averages.  
 Vertical lines indicate the overall median, shading indicates the uncertainty in the median.



**Figure 8: Proportion of YouTube content available in UHD for NBN 100/20 and Fibre 100 plans**

Higher proportion is better.  
 Bars show the distribution of household averages.  
 Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- Almost all services on 100/20 Mbps plans can support more than 4 concurrent Ultra High Definition Netflix streams, with the median values being 7 concurrent UHD streams for Australia and 8 concurrent UHD streams for New Zealand.
- All services on Australia and New Zealand's 100/20 Mbps plans support streaming 90% or more of YouTube's content in UHD.
- In conclusion, 100/20 Mbps fixed-line plans offer good streaming quality in both countries (although the overall user experience may be limited by other factors).

# Very high speed fibre plans

In this section we compare the performance of very high speed plans over a FTTP connection. Australia's NBN Ultrafast plan is advertised as having a download/upload speed range of 500-990/50 Mbps. New Zealand's Fibre Max plans are sold under different advertised speed claims of 900/400 Mbps, 900/450 Mbps, 950/450 Mbps and 950/500 Mbps.

Similar plans also exist over HFC connection in both countries under NBN Ultrafast in Australia and HFC Max in New Zealand. However, the HFC Max plan is only available in certain areas of New Zealand, and so these plans are not compared in this report.

## Download speeds

Figure 9 compares the download speeds attained by services on Australia's NBN Ultrafast plans over FTTP and New Zealand's Fibre Max plans.

The data presented includes data for busy hours and outside of busy hours. Figure 9 also shows the "busiest hour" download speed for both plans.

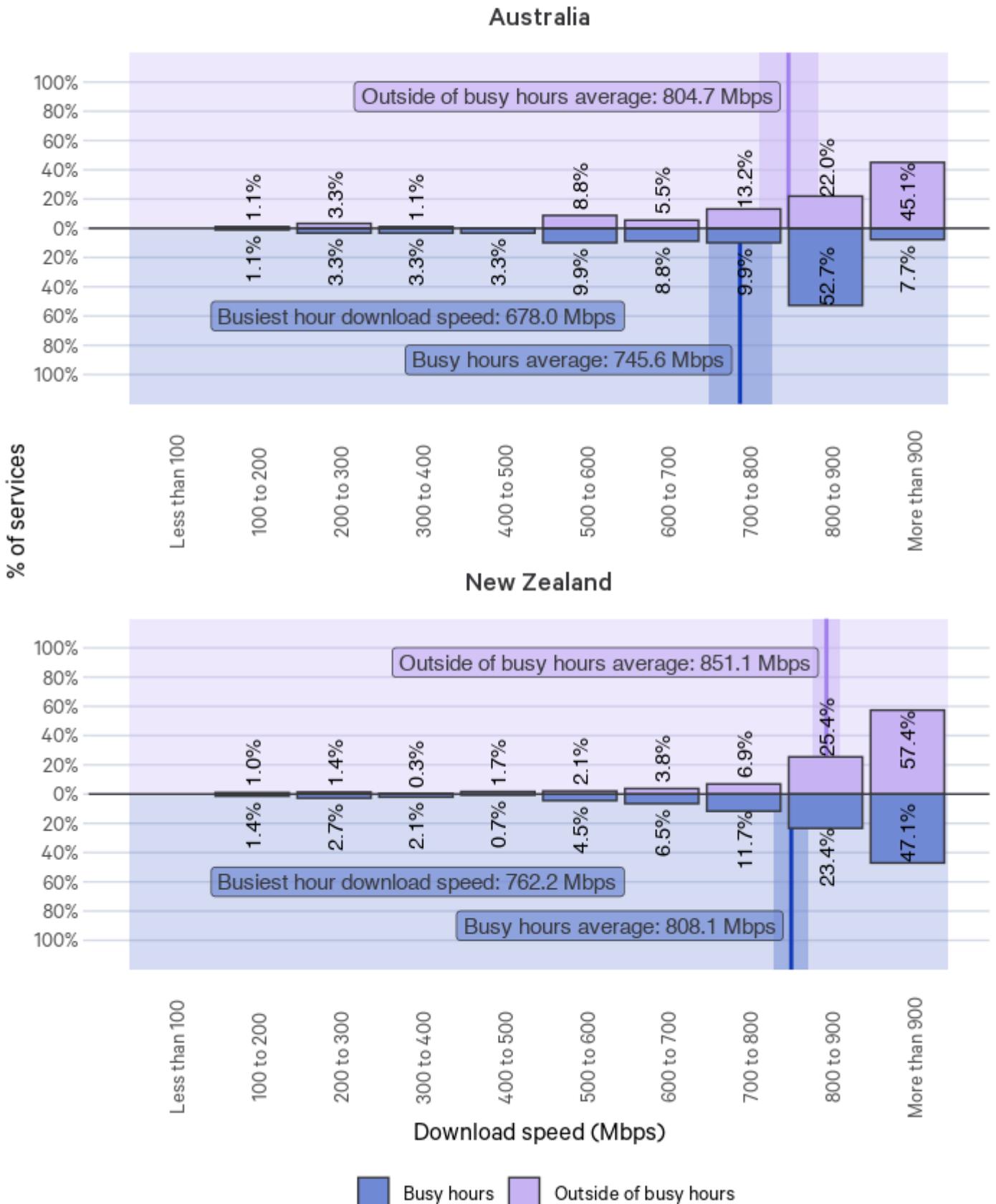
Figure 10 shows the smoothed hourly download speeds averaged across the month for every hour when measurements are scheduled. Missing data points indicate that measurements are not scheduled to take place in that hour.

## Figure 9: Distribution of download speeds for NBN Ultrafast and Fibre Max plans

Higher download speed is better. Busy hours are Monday - Friday, 7pm - 11pm.

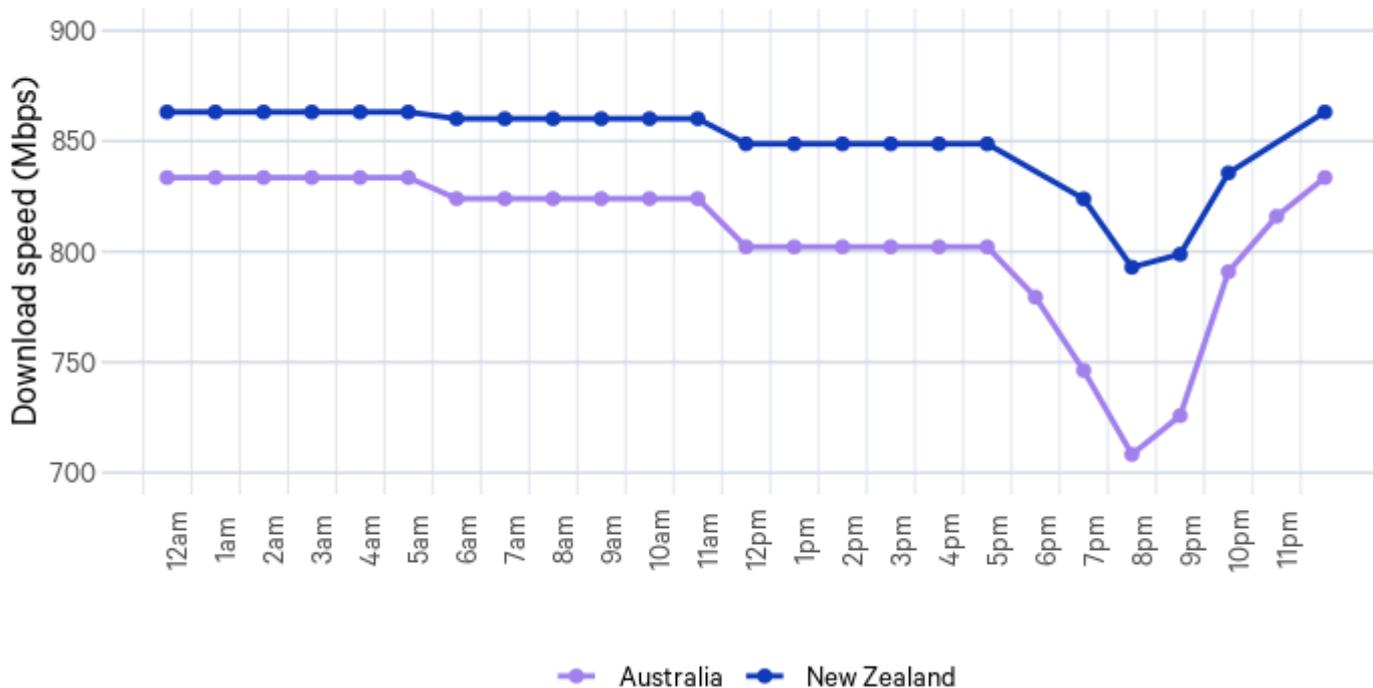
Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



**Figure 10: Average hourly download speed for NBN Ultrafast and Fibre Max plans**

Higher download speed is better.



**Key observations**

- The proportion of services attaining an average download speed over 900 Mbps is greater for Fibre Max, particularly during busy hours (see Figure 9).
- The difference between average download speeds during busy hours and outside of busy hours is greater for NBN Ultrafast. Similarly, the download speed during the busiest hour drops even more significantly for NBN Ultrafast. This indicates that services on the NBN Ultrafast plan were more affected by the increased traffic during busy periods than services on the Fibre Max plan.
- The hourly results for both countries show a decrease during 7pm - 11pm (see Figure 10). This decrease is driven by the increased traffic during busy hours (7pm - 11pm on Monday Friday).
- The lowest speeds are measured during 8pm - 9pm in both countries. The drop in download speed is greater for the NBN Ultrafast plan.

**Upload speeds**

Figure 11 compares the upload speeds attained by services on Australia’s NBN Ultrafast plans over FTTP and New Zealand’s Fibre Max plans.

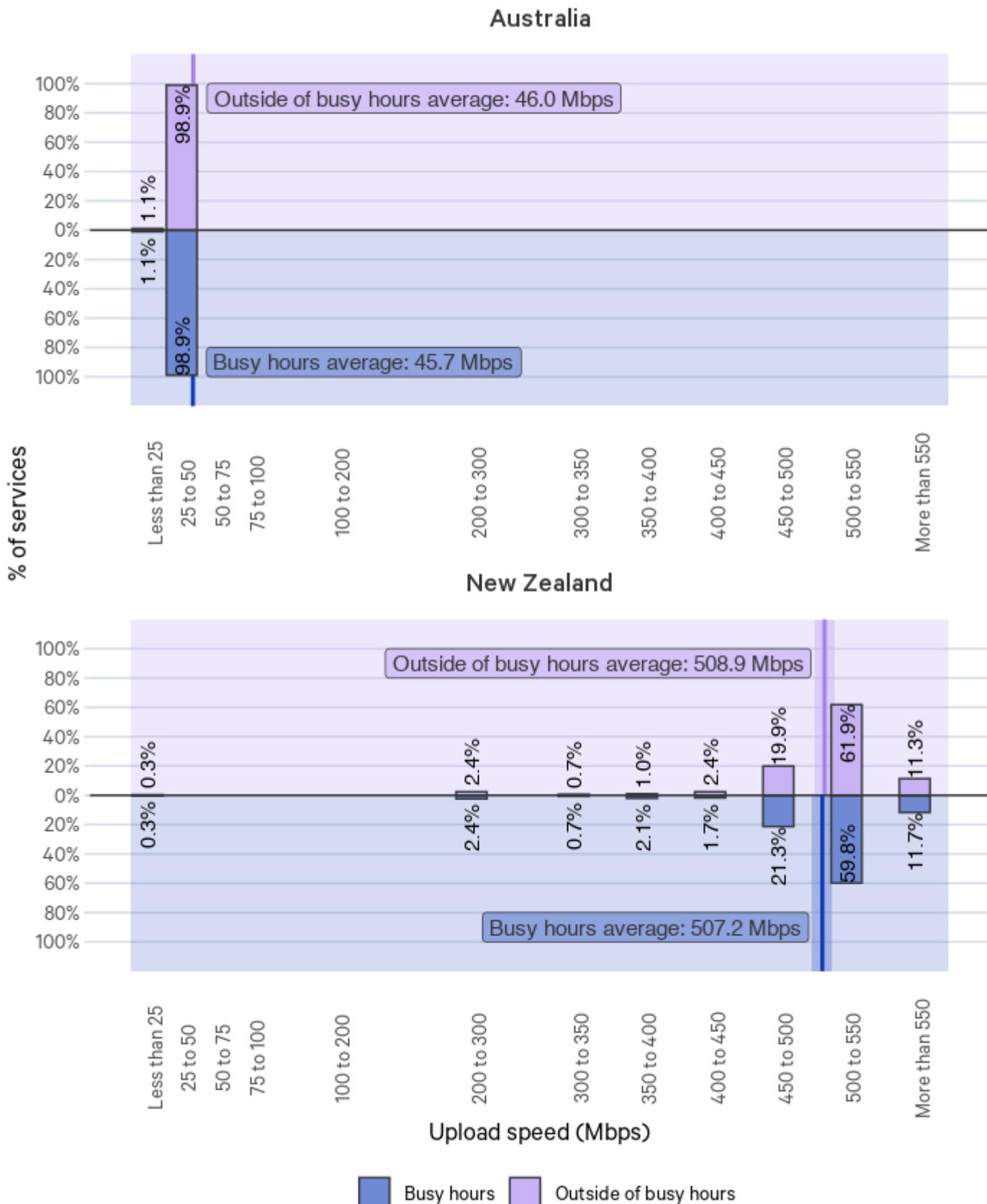
Data collected during busy hours and outside of busy hours is presented separately.

## Figure 11: Distribution of upload speeds for NBN Ultrafast and Fibre Max plans

Higher upload speed is better.

Bars show the distribution of household averages, vertical lines show the overall average.

Busy hours are Monday - Friday, 7pm - 11pm.



## Key observations

- The average upload speeds measured are very different in the two countries, with 50 Mbps being offered in Australia and 400-500 Mbps in New Zealand. This is largely in line with the plan speeds.
- Average upload speeds in Australia do not exceed the plan speed of 50 Mbps, but average upload speeds in New Zealand are often higher than advertised.
- As with the 100/20 plans, upload speeds are less affected by busy hours.

## Latency

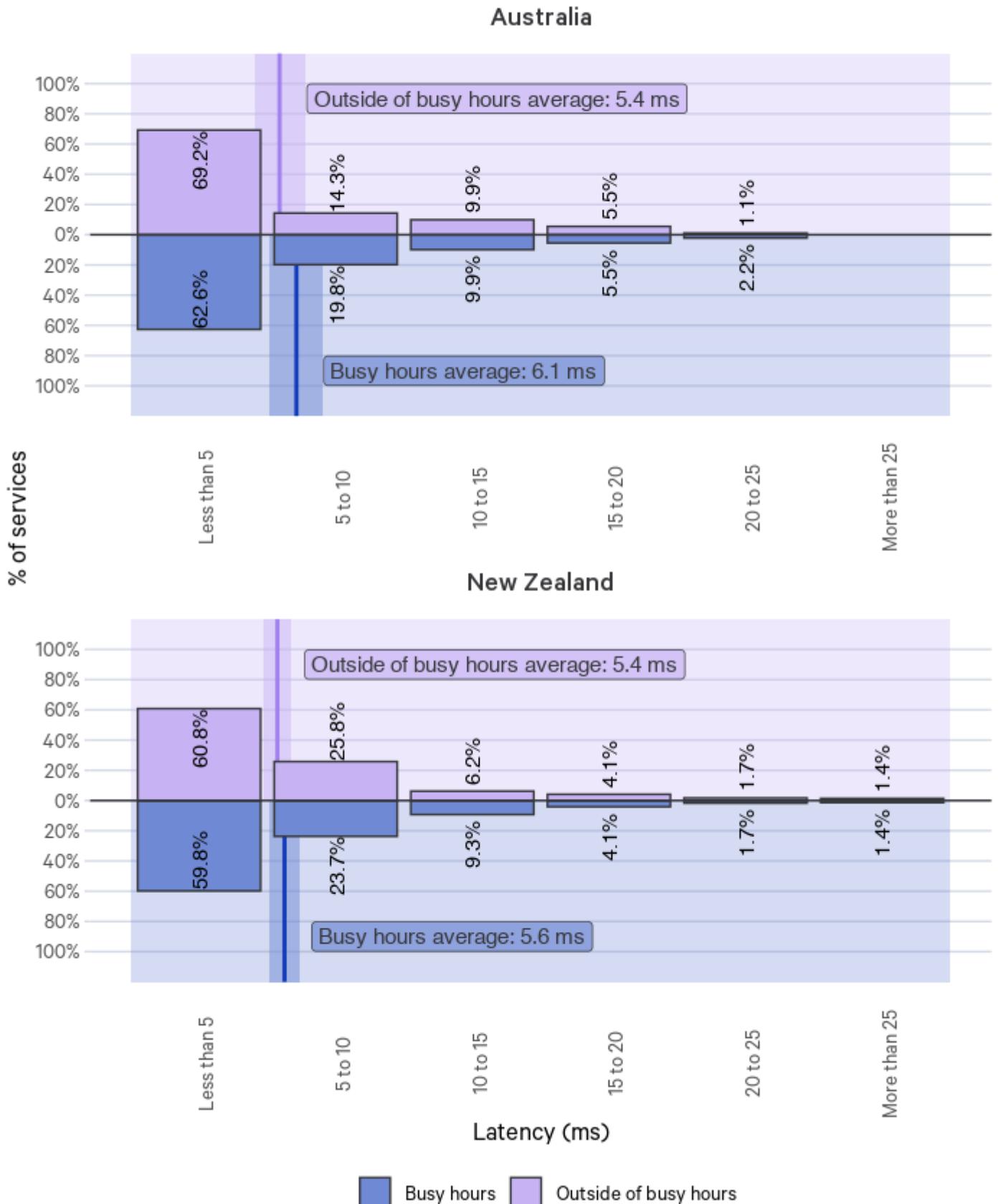
Figure 12 compares the average latency of services on Australia's NBN Ultrafast plans over FTTP and New Zealand's Fibre Max plans.

Data collected during busy hours and outside of busy hours is presented separately.

## Figure 12: Distribution of latencies for NBN Ultrafast and Fibre Max plans

Lower latency is better. Busy hours are Monday - Friday, 7pm - 11pm. Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- More than 95% of NBN Ultrafast and Fibre Max services experience latency of 20 ms and under, both during and outside of busy hours. Latency at this level provides very good support for the normal operation of most end-user applications.
- Fibre Max and NBN Ultrafast had similar average latencies outside of busy hours, but the increase in average latency during busy hours was slightly higher for NBN Ultrafast.

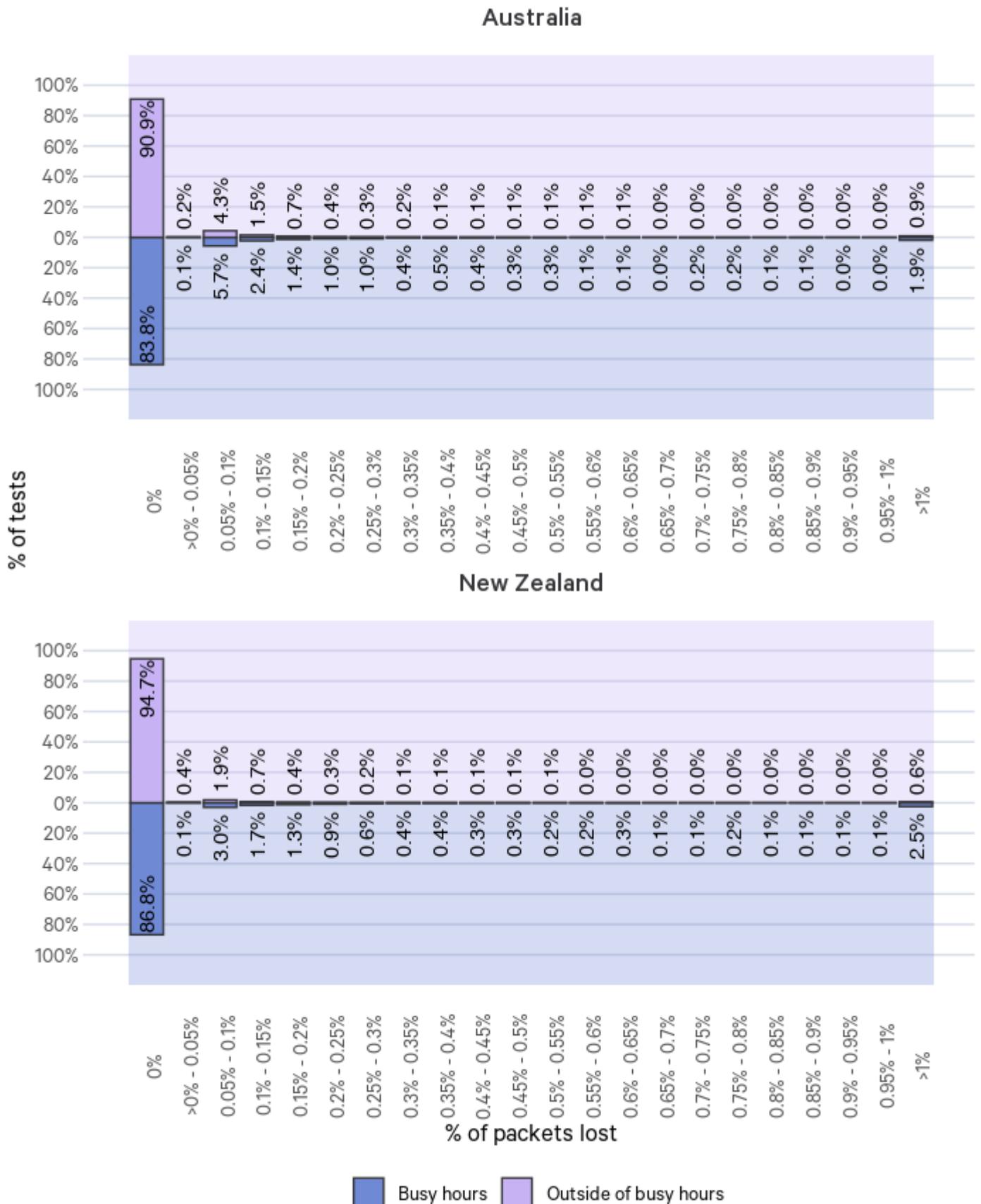
## Packet loss

Figure 13 compares the distribution of average household packet loss rates for Australia's NBN Ultrafast plans over FTTP and New Zealand's Fibre Max plans.

Data collected during busy hours and outside of busy hours is presented separately.

**Figure 13: Distribution of packet loss rates for NBN Ultrafast and Fibre Max plans**

Lower packet loss is better. Busy hours are Monday - Friday, 7pm - 11pm. Bars show the distribution of household averages.



## Key observations

- The proportion of households experiencing an average rate of packet loss above 1% is relatively small outside of busy hours, but increases during busy hours in both countries.

## Outages

Figure 14 compares the frequency of outages experienced by services on Australia's NBN Ultrafast plans over FTTP and New Zealand's Fibre Max plans.

Data is shown for all hours.

**Figure 14: Distribution of outage frequencies for NBN Ultrafast and Fibre Max plans**

Lower outage frequency is better.

Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- The rate of outages lasting longer than 30 seconds was found to be low in both countries. At an average rate of about one outage lasting longer than 30 seconds per week, outages are unlikely to have an impact on user experience.
- It is worth noting that while the overall average rate of outages is very low, there are a few services in each country that experience a considerably higher rate of outages at one or more outages per day.

## Streaming services

Similarly to the 100/20 Mbps fixed-line plans, the quality of experience when using streaming services such as Netflix or YouTube over Australia's NBN Ultrafast plans or New Zealand's Fibre Max plans would not be limited by the connection itself. Both plans are able to support a high number of concurrent UHD streams from Netflix on average, and almost all YouTube content is available in UHD for almost all services on these plans. For the sake of brevity, figures corresponding to these results are not included in this report.

# Fixed wireless plans

In this section we compare the performance of Australia’s NBN Fixed Wireless Plus plan with New Zealand’s 4G fixed wireless product. The fixed wireless networks of the two countries utilise similar technologies, but the products are marketed differently in the two countries. The download and upload speed of the NBN Fixed Wireless plan is provided on a “best effort” basis but is benchmarked at 50/10 Mbps. New Zealand’s 4G fixed wireless plans are provided on a “best effort” basis for both the download and the upload. The best available speeds can vary between services and at different times of the day.

## Download speeds

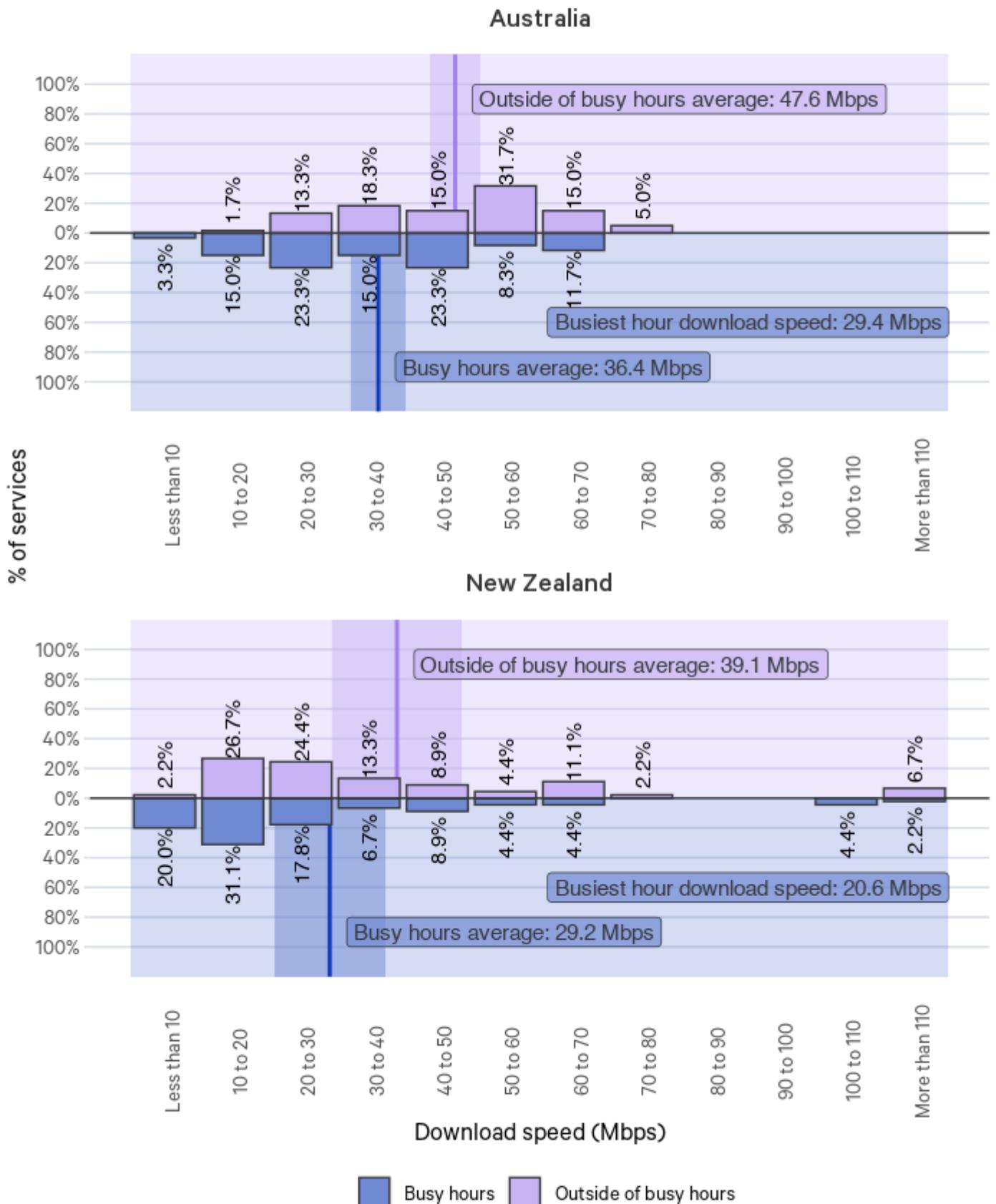
Figure 15 compares the download speeds attained by fixed wireless services in Australia and New Zealand (4G only).

Data collected during busy hours and outside of busy hours is presented separately. Figure 15 also shows the “busiest hour” download speed for both plans.

Figure 16 shows the smoothed hourly download speeds averaged across the month for every hour when measurements are scheduled. Missing data points indicate that measurements are not scheduled to take place in that hour.

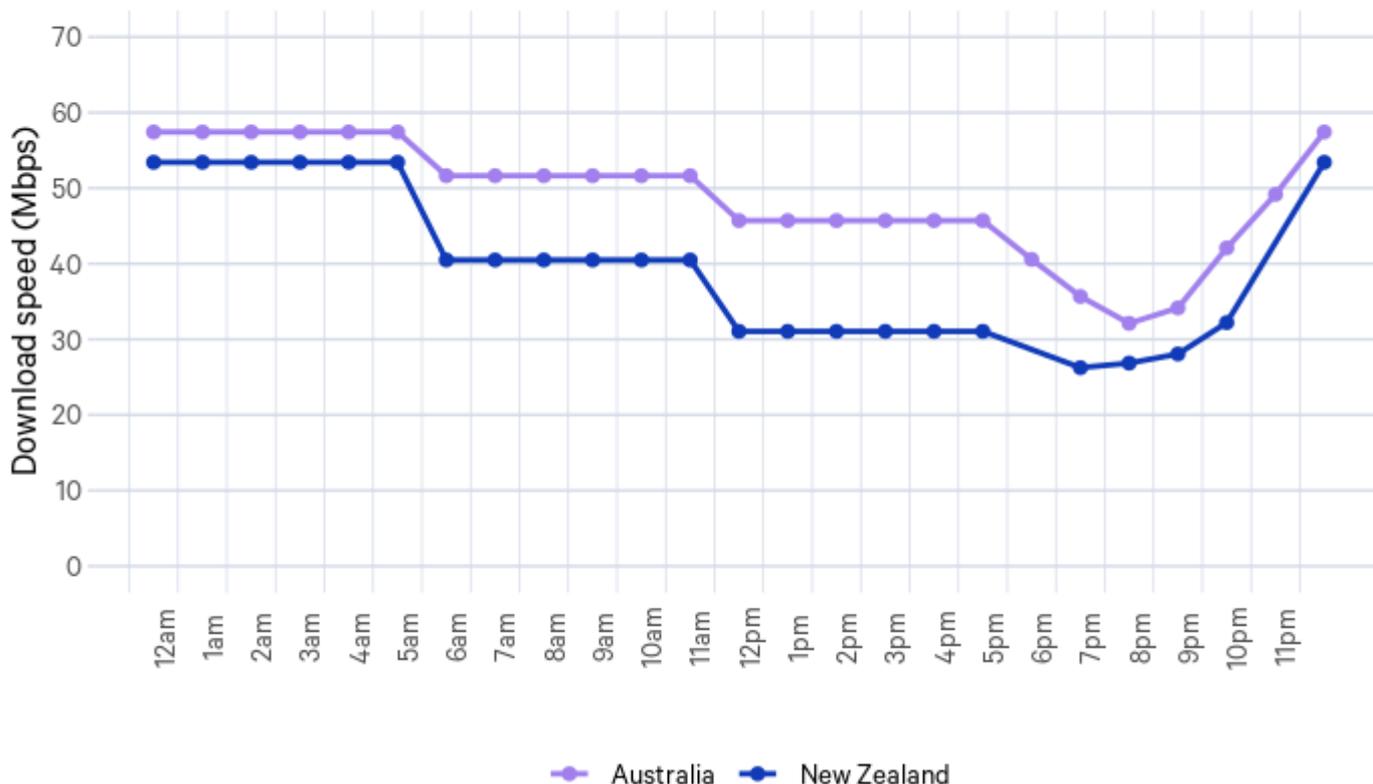
**Figure 15: Distribution of download speeds for NBN Fixed Wireless Plus and 4G fixed wireless plans**

Higher download speed is better. Busy hours are Monday - Friday, 7pm - 11pm.  
 Bars show the distribution of household averages.  
 Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



**Figure 16: Average hourly download speed for NBN Fixed Wireless Plus and 4G fixed wireless plans**

Higher download speed is better.



### Key observations

- Average download speeds over fixed wireless are higher in Australia both during busy hours and outside of busy hours.
- The busiest hour download speed in both countries is lower than the average download speed during busy hours. This indicates that periods of high demand affected the download performance in both countries.
- The hourly results for both countries show a gradual decrease during the day, reaching the lowest performance around 7pm-8pm in New Zealand and 8pm-9pm in Australia. The drop in download speed during the evening hours is significant in both countries.

## Upload speeds

Figure 17 compares the upload speeds attained by fixed wireless services in Australia and New Zealand (4G only).

Data collected during busy hours and outside of busy hours is presented separately.

### Figure 17: Distribution of upload speeds for NBN Fixed Wireless Plus and 4G fixed wireless plans

Higher upload speed is better. Busy hours are Monday - Friday, 7pm - 11pm. Bars show the distribution of household averages. Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- The majority of New Zealand's fixed wireless services achieve a higher upload speed than Australia's NBN Fixed Wireless Plus.

## Latency

Figure 18 compares the average latency attained by fixed wireless services in Australia and New Zealand (4G only).

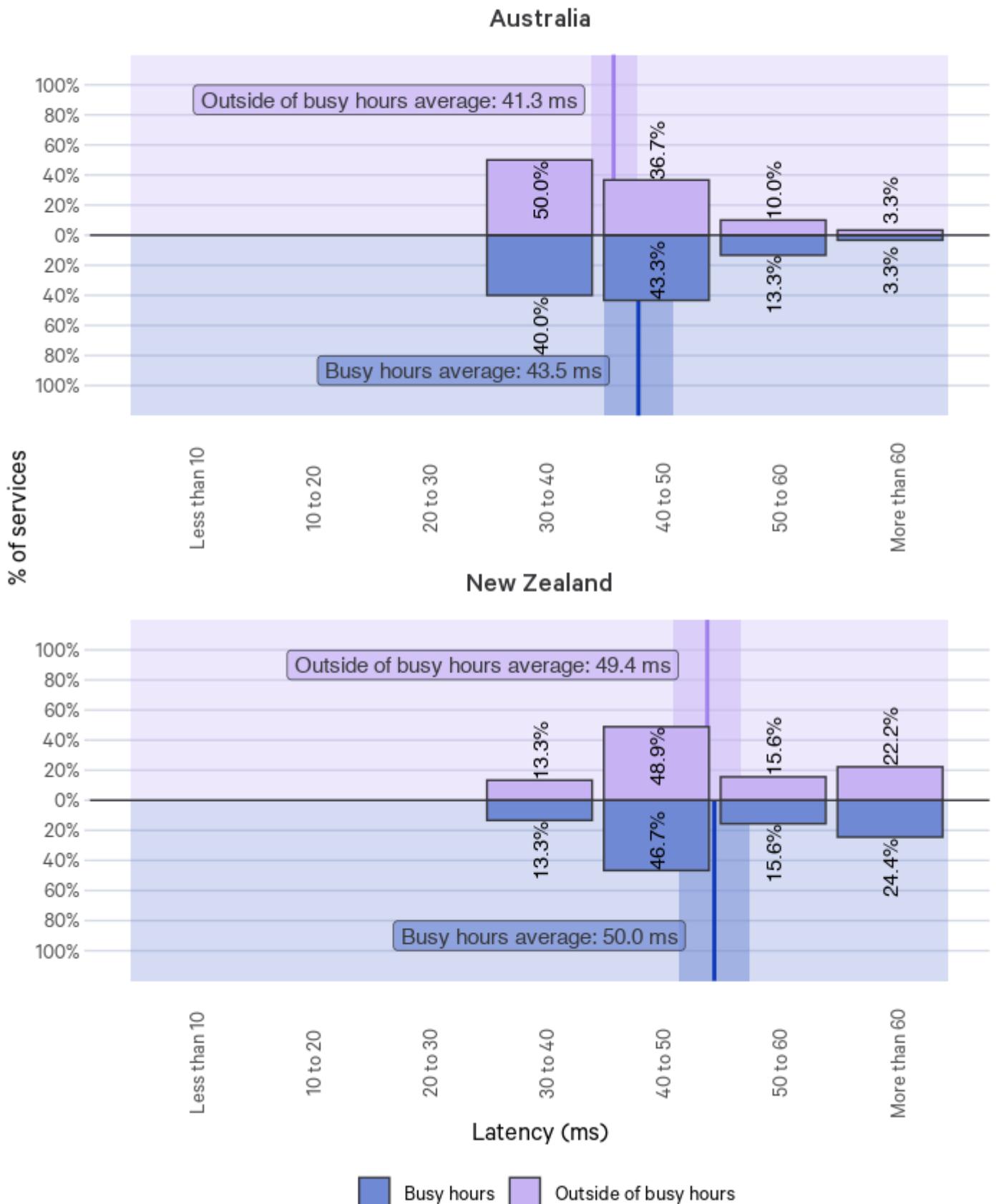
Data collected during busy hours and outside of busy hours is presented separately.

## Figure 18: Distribution of latencies for NBN Fixed Wireless Plus and 4G fixed wireless plans

Lower latency is better. Busy hours are Monday - Friday, 7pm - 11pm.

Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- Fixed wireless services typically have higher latencies than fixed-line services. Latency over fixed wireless often falls in the 40-50 ms range, which may impact end users using latency-sensitive applications (for example, video conferencing).
- Australia's Fixed Wireless Plus services appear to have a slightly lower latency than New Zealand's 4G fixed wireless services. The proportion of services having an average latency of 60 ms or more is considerably higher in New Zealand.

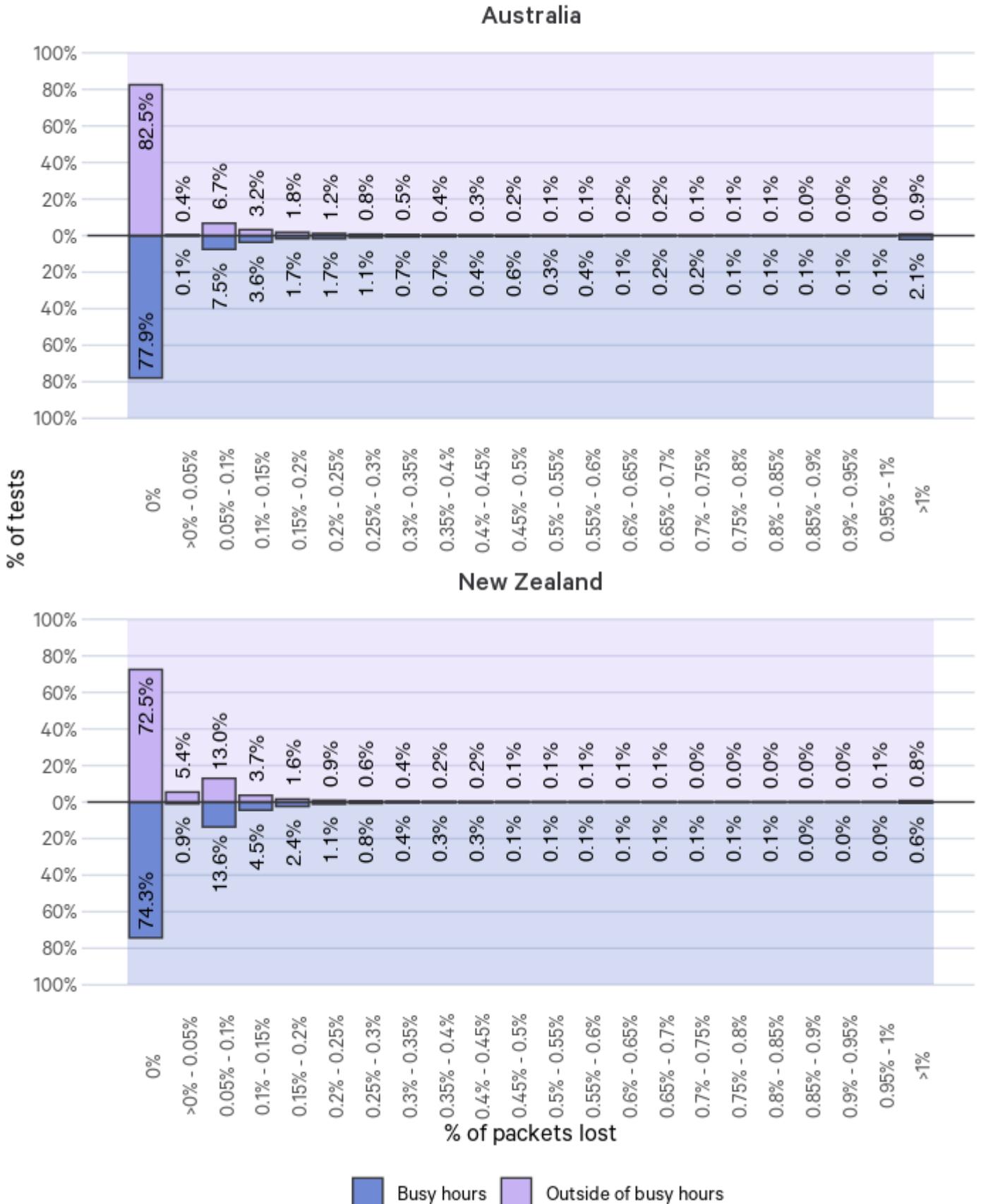
## Packet loss

Figure 19 compares the distribution of average household packet loss rates for fixed wireless services in Australia and New Zealand (4G only).

Data collected during busy hours and outside of busy hours is presented separately.

**Figure 19: Distribution of packet loss rates for NBN Fixed Wireless Plus and 4G fixed wireless plans**

Lower packet loss is better. Busy hours are Monday - Friday, 7pm - 11pm. Bars show the distribution of household averages.



## Outages

Figure 20 compares the frequency of outages experienced by fixed wireless services in Australia and New Zealand (4G only).

Data is shown for all hours.

**Figure 20: Distribution of outage frequencies for NBN Fixed Wireless Plus and 4G fixed wireless plans**

Lower outage frequency is better.

Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- The overall rate of outages over fixed wireless connections was found to be higher in both countries than over fixed-line connections. However, even the comparatively high rate of 4-5 outages per week in New Zealand (less than one a day) is low enough to not have a detrimental effect on user experience.
- While over half of New Zealand's fixed wireless services experience a very low rate of fewer than 1 outage per week, the proportion of services that experience one or more outages per day is higher than over fixed-line connections in New Zealand, and also higher than the proportion of Australia's NBN Fixed Wireless Plus services experiencing a similarly high rate of outages.

## Streaming services

Figures 21 and 22 show Netflix and YouTube results over fixed wireless connections in Australia and New Zealand (4G only).

Figure 21 shows the maximum number of concurrent UHD streams from Netflix.

Figure 22 shows the proportion of content available in UHD quality from YouTube.

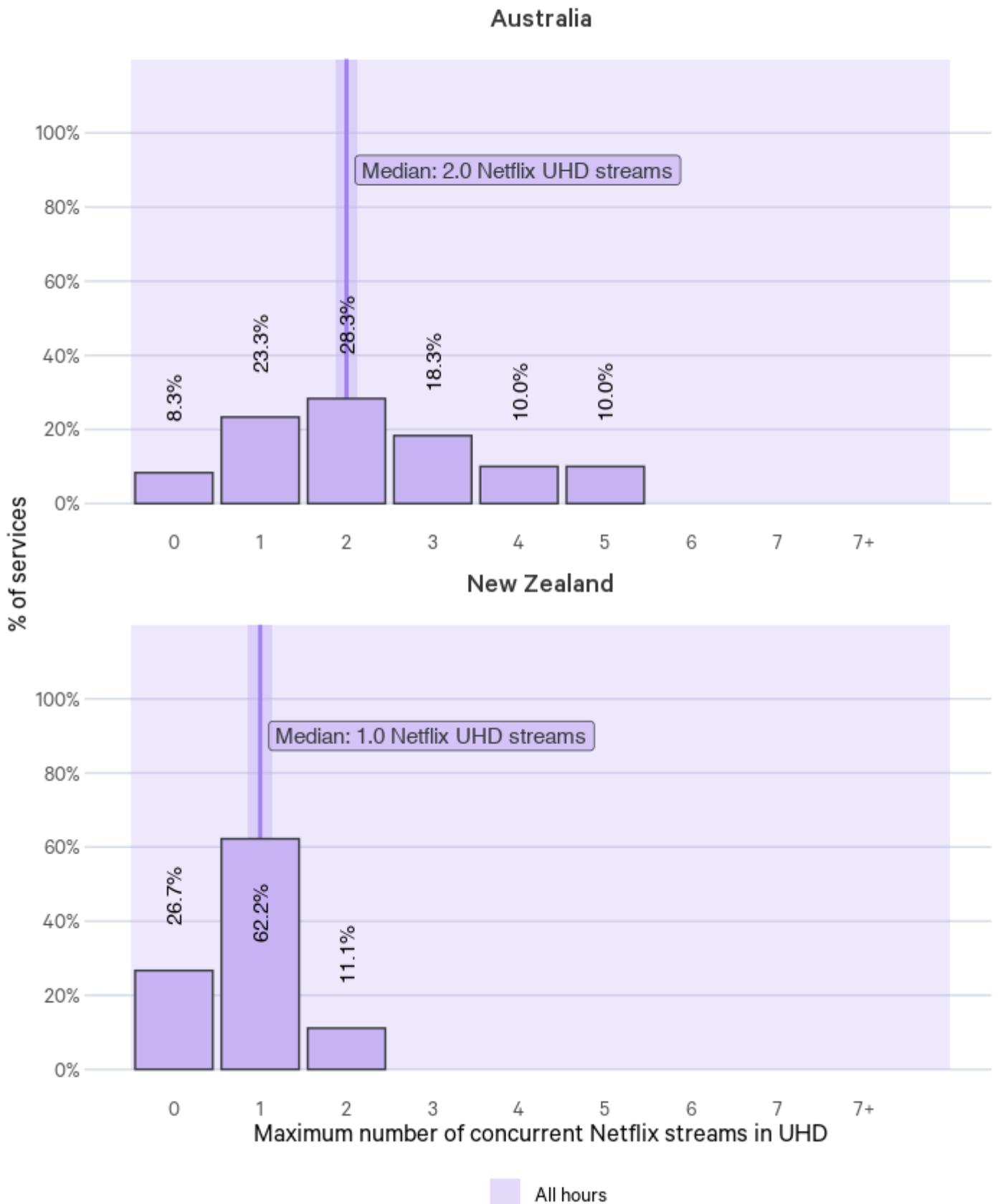
Data is shown for all hours.

**Figure 21: Maximum number of concurrent Netflix UHD streams supported by NBN Fixed Wireless Plus and 4G fixed wireless plans**

Higher number is better.

Bars show the distribution of household averages.

Vertical lines indicate the overall median, shading indicates the uncertainty in the median.

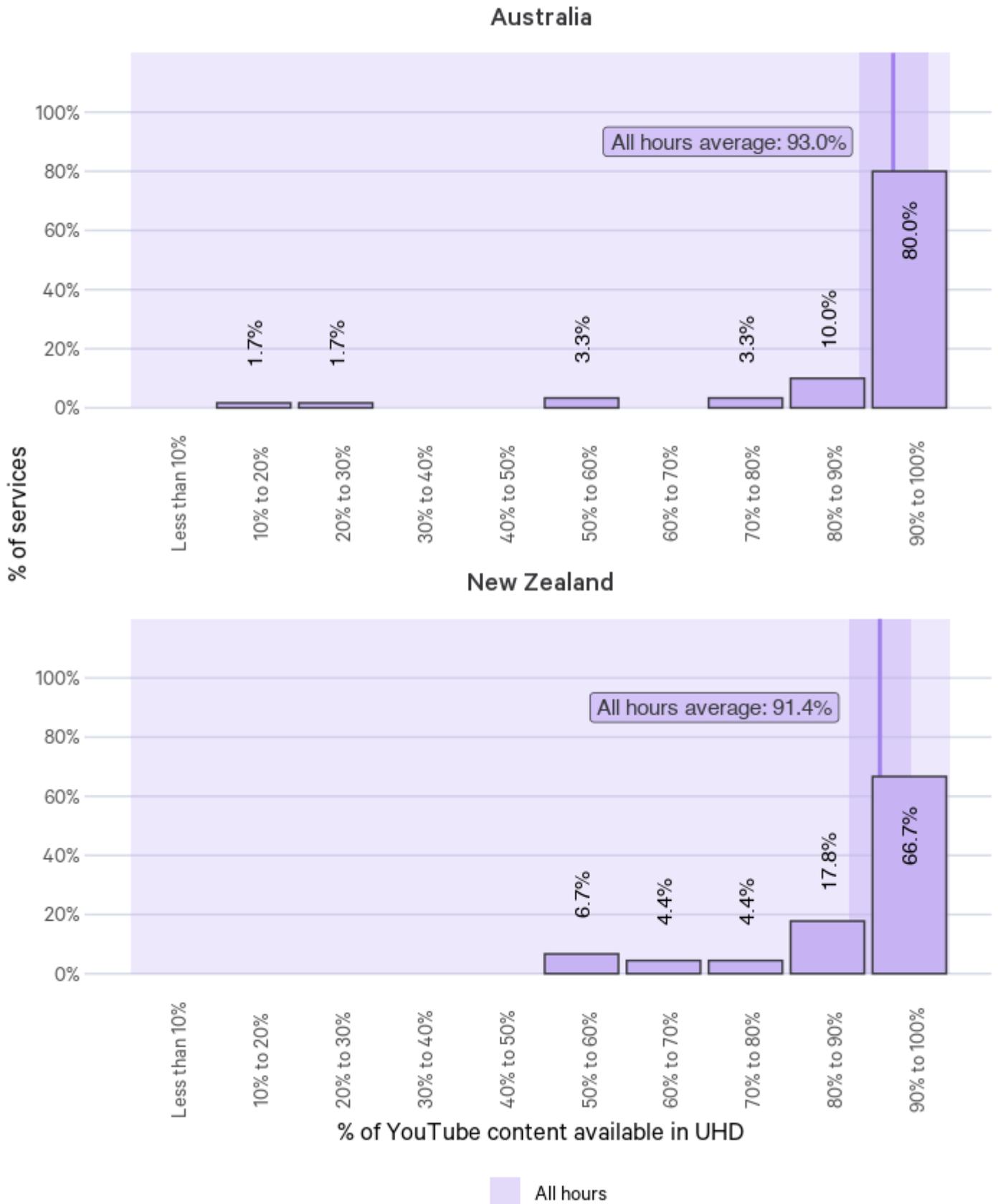


**Figure 22: Proportion of YouTube content available in UHD for NBN Fixed Wireless Plus and 4G fixed wireless plans**

Higher proportion is better.

Bars show the distribution of household averages.

Vertical lines indicate the overall average, shading indicates the uncertainty in the average.



## Key observations

- While the quality of streaming experience was excellent over the 100/20 Mbps and very high speed fixed-line plans, streaming performance is much more variable over fixed wireless.
- The median number of concurrent UHD Netflix streams over Australia's NBN Fixed Wireless Plus plan (2 Netflix UHD streams) was higher than that over New Zealand's 4G fixed wireless plans (1 Netflix UHD stream, see Figure 21).
- The proportion of services that could consistently stream Netflix content in UHD was lower in New Zealand.
- In both countries, most consumers were able to stream 90% or more of YouTube's content in UHD over fixed wireless, but some fixed wireless users in both countries were only able to stream a lower proportion of content in UHD. Australia's NBN Fixed Wireless Plus plan performed slightly better both in respect of the average proportion of content available in UHD, and the proportion of services able to stream at least 90% of content in UHD on average.

# Data tables

## Fixed-line 100/20 Mbps plans

NBN 100/20 plans over FTTP and HFC and Fibre 100 plans

Metric	Panel size (AUS)	Mean (AUS)	95% confidence interval of the mean (AUS)	Panel size (NZ)	Mean (NZ)	95% confidence interval of the mean (NZ)
Download - busy hours	54	100.2 Mbps	98.1-102.4 Mbps	263	100.3 Mbps	99.4-101.1 Mbps
Download - outside of busy hours	54	102.1 Mbps	100.1-104.1 Mbps	263	101.2 Mbps	100.4-102.0 Mbps
Upload - busy hours	54	18.2 Mbps	18.0-18.4 Mbps	263	22.3 Mbps	22.0-22.7 Mbps
Upload - outside of busy hours	54	18.3 Mbps	18.1-18.5 Mbps	263	22.4 Mbps	22.1-22.7 Mbps
Latency - busy hours	54	9.6 ms	8.1-11.1 ms	260	6.8 ms	6.3-7.4 ms
Latency - outside of busy hours	54	8.4 ms	7.0-9.8 ms	260	6.7 ms	6.2-7.3 ms
Outages - all hours	54	1.1 per week	0.3-1.9 per week	259	0.9 per week	0.2-1.6 per week

## Very high speed fibre plans

Metric	Panel size (AUS)	Mean (AUS)	95% confidence interval of the mean (AUS)	Panel size (NZ)	Mean (NZ)	95% confidence interval of the mean (NZ)
Download - busy hours	91	745.6 Mbps	707.2-784.0 Mbps	288	808.1 Mbps	787.2-829.1 Mbps
Download - outside of busy hours	91	804.7 Mbps	768.2-841.2 Mbps	290	851.1 Mbps	834.2-868.0 Mbps
Upload - busy hours	91	45.7 Mbps	45.1-46.3 Mbps	288	507.2 Mbps	499.9-514.6 Mbps
Upload - outside of busy hours	91	46.0 Mbps	45.4-46.5 Mbps	290	508.9 Mbps	501.7-516.1 Mbps
Latency - busy hours	91	6.1 ms	5.1-7.0 ms	287	5.6 ms	5.1-6.2 ms
Latency - outside of busy hours	91	5.4 ms	4.5-6.4 ms	287	5.4 ms	4.8-5.9 ms
Outages - all hours	91	0.9 per week	0.4-1.3 per week	284	0.5 per week	0.4-0.6 per week

## Fixed wireless plans

Metric	Panel size (AUS)	Mean (AUS)	95% confidence interval of the mean (AUS)	Panel size (NZ)	Mean (NZ)	95% confidence interval of the mean (NZ)
Download - busy hours	60	36.4 Mbps	32.3-40.4 Mbps	45	29.2 Mbps	21.1-37.3 Mbps
Download - outside of busy hours	60	47.6 Mbps	44.0-51.2 Mbps	45	39.1 Mbps	29.6-48.6 Mbps
Upload - busy hours	60	4.0 Mbps	3.5-4.5 Mbps	45	17.0 Mbps	13.4-20.6 Mbps
Upload - outside of busy hours	60	5.3 Mbps	4.8-5.8 Mbps	45	18.0 Mbps	14.3-21.7 Mbps
Latency - busy hours	60	43.5 ms	40.5-46.4 ms	45	50.0 ms	47.0-52.9 ms
Latency - outside of busy hours	60	41.3 ms	39.4-43.3 ms	45	49.4 ms	46.5-52.2 ms
Outages - all hours	60	1.3 per week	0.6-2.0 per week	45	4.2 per week	0.4-8.0 per week

# Glossary

Term	Definition
SamKnows	The independent testing provider appointed to conduct testing for Measuring Broadband Australia and Measuring Broadband New Zealand. <a href="https://samknows.com/">https://samknows.com/</a>
Whitebox	A purpose-built hardware measurement agent manufactured by SamKnows, installed in volunteers' homes.
Testing Infrastructure	SamKnows-maintained test servers hosted in different countries.
RSP	Retail Service Provider. A company that provides consumers with access to the internet.
Customer-Premises Equipment (CPE)	Network equipment provided by an RSP (generally including a home router/gateway).
Broadband	A network service or connection which is defined as “always on”, as opposed to historical dial-up internet.
Broadband speed	The speed at which data is transmitted over a broadband connection, usually measured in megabits per second (Mbps).
Advertised speed	The speed at which broadband services are typically advertised or marketed, usually described in Mbps. On some networks, such as New Zealand's 4G fixed wireless network, these are not given as a general maximum but vary from line to line as they do not transmit data without depreciation across distance.
Plan speed	The download and upload speeds associated the relevant retail plan. For example, plan speeds for New Zealand's Fibre 100 plan are 100 Mbps down and 20 Mbps up.
Fixed-line	For reporting, fixed-line encompasses the FTTP (fibre to the premises), FTTB (fibre to the building), HFC (hybrid fibre-coaxial), FTTC (fibre to the curb), and FTTN (fibre to the node) access technologies.
Fibre	A broadband connection that uses fibre-optic cables to send data to and from a property directly. Sometimes referred to as FTTH (fibre-to-the-home) or FTTP (fibre-to-the-premises).
Fixed wireless	A broadband connection that uses radio waves to provide internet access to a premises.
All hours	Refers to tests conducted at any time of the day.
Busy hours	Refers to tests conducted between 19:00:00 and 22:59:59, Monday to Friday (local time). This is the time of day when people are typically using their internet connection.
Download speed	The speed that data travels from our test server to your router. Measured in megabits per second (Mbps); higher is better.
Upload speed	The speed that data travels from your router to our test server. Measured in Mbps (megabits per second); higher is better.
Latency	The time it takes for a data packet to travel from your router to our test server and back. Measured in milliseconds (ms); lower is better.
Packet loss	The percentage of packets that were lost somewhere between your router and our test server. Measured as a percentage of all packets sent; lower is better.
Disconnection	A disconnection means that two or more latency measurement packets in a row were lost, resulting in stuttering broadband performance.