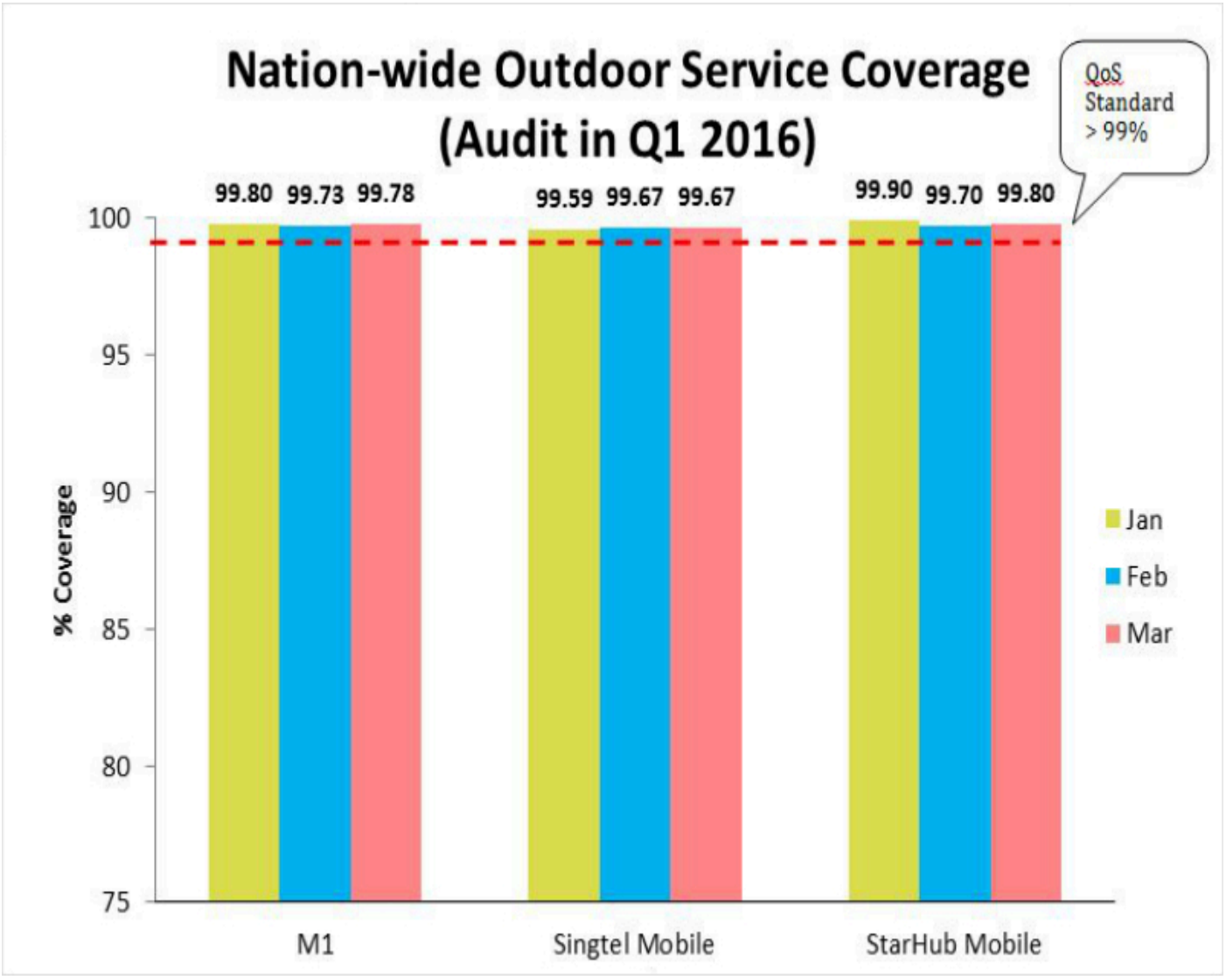
Quality of Service Performance Results for January-March 2016

Nation-wide Outdoor Service Coverage

This indicator measures Nation-Wide Outdoor Service Coverage for the 3G cellular network. Service coverage is determined by signal strength. The availability of service coverage is the ability of a cellular network to achieve the minimum signal strength of at least -100dBm. Under IDA's 3G Public Cellular Mobile Telephone Service ("PCMTS") QoS framework, mobile operators are required to achieve Nation-Wide Outdoor Service Coverage of >99%. In order to better measure the end users' experience*, IDA has used mobile handsets to collect the signal strength sample readings for all service coverage indicators starting from Q2 2013.



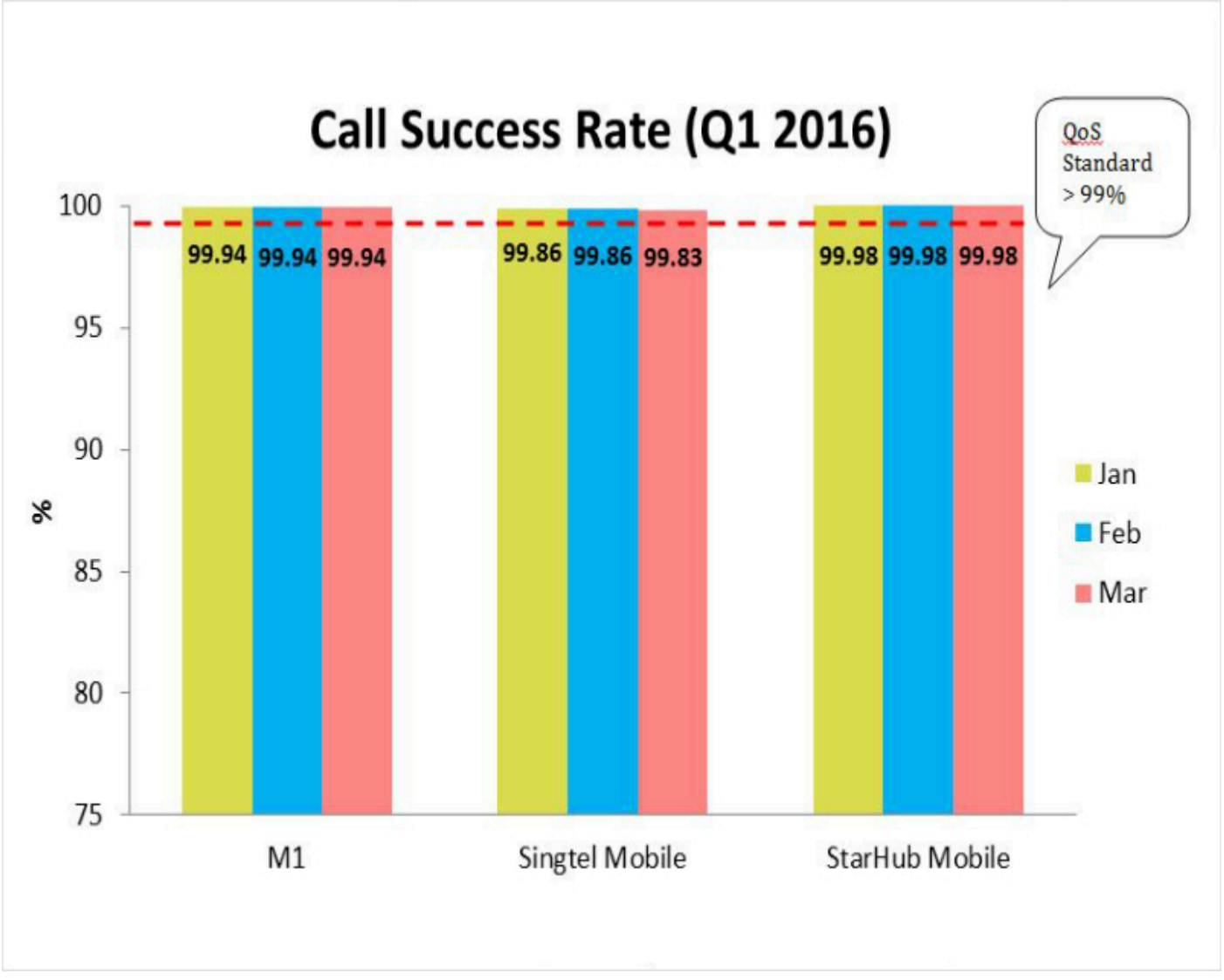
*Based on IDA's coverage performance surveys which included nation-wide outdoor drive test and areas such as housing estates/town centres, outdoor recreational areas and above ground MRT tracks.

Note: End users' individual experience may differ due to various reasons such as model of handset used, handset settings, number of users in the vicinity, etc.

Call Success Rate

This indicator measures the percentage of successful call attempts made on the 3G cellular network. A call attempt is deemed successful when the calling party (the individual who makes the call) gets connected to the called party

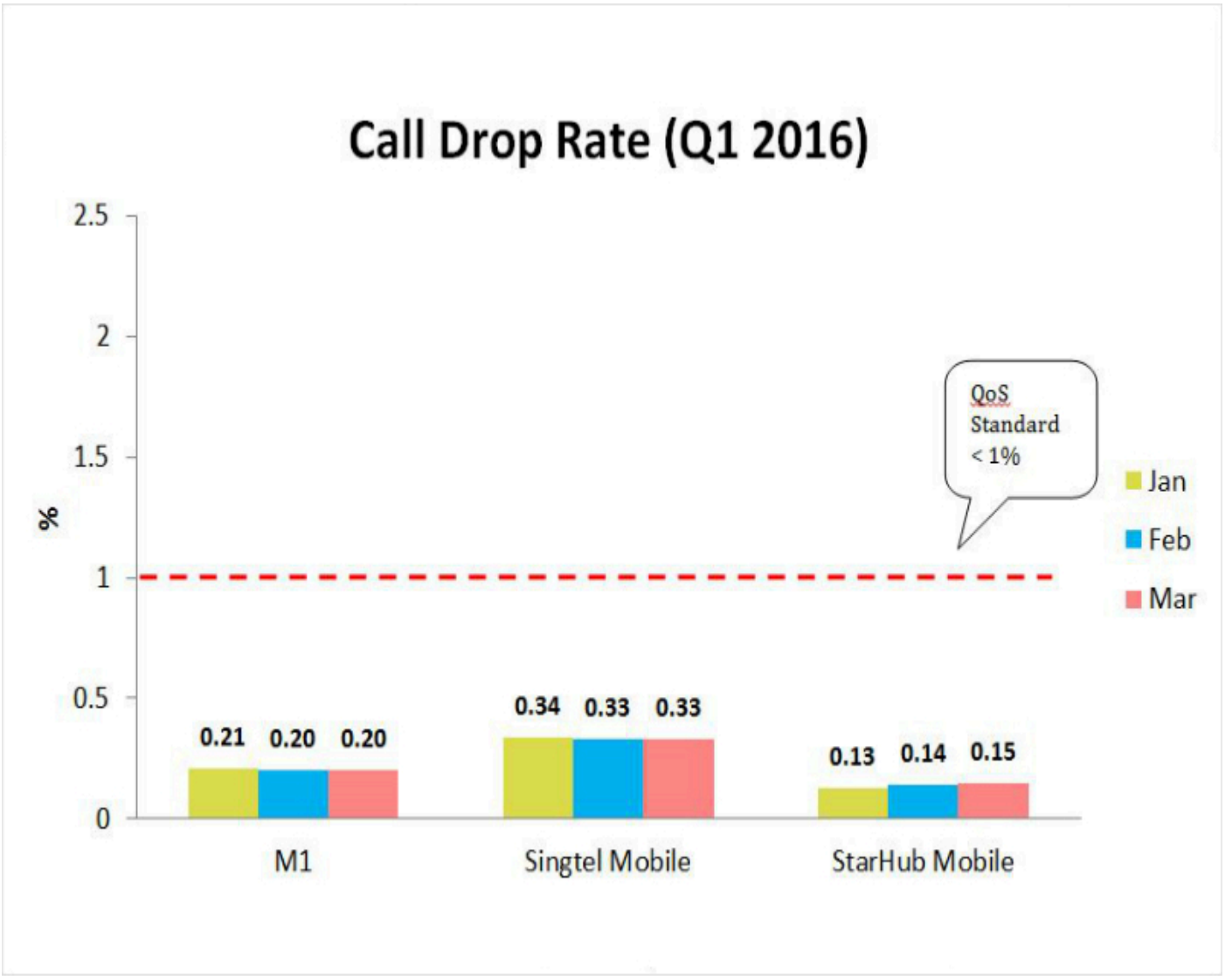
(the individual who receives the call) or receives a busy tone. Under IDA's 3G PCMTS QoS framework, the mobile operators are required to achieve >99% success rate (average across all cell localities during busy hour).



Note: Call success rates are based on the mobile telecommunication operator's actual network traffic logs.

Call Drop Rate

This indicator measures the percentage of unintended disconnection of 3G mobile calls by the cellular network during a 100 second call. Under IDA's 3G PCMTS QoS framework, mobile operators are required to achieve <1% drop call rate (average across the entire month).



Note: Call drop rates are based on the mobile telecommunication operator's actual network traffic logs.

In-building Service Coverage

This indicator measures in-building service coverage for the 3G cellular network. Under IDA's 3G PCMTS QoS framework, mobile operators are required to achieve a service coverage of >85% per building. Service coverage is measured at randomly selected buildings and at publicly accessible areas within the tested buildings as a proxy for the coverage in the entire building to avoid disturbing residents. For buildings that have failed IDA's compliance standard, mobile operators will have a period of six months to improve the coverage within the buildings. IDA will audit the buildings again after the six-month period.

IDA's Performance Survey Period: Q1 2016

M1	**SingTel Mobile**	**StarHub Mobile**
No of buildings passed/No of buildings tested Compliance standard >85% per building		
60/60	60/60* (retest result, original result in Q1 2016 was 59/60)	60/60

Note: The same sixty buildings were tested across the three mobile operators. The performance of each of the mobile operator varies for each of the building tested. End users' individual experience may differ due to various reasons such as model of handset used, handset settings, building/unit structures, number of users in the vicinity, etc. The in-building service coverage results are based on IDA's coverage performance surveys.

*The updated performance survey results before or after the four-month rectification period.

Tunnel Service Coverage

This indicator measures service coverage for the 3G cellular network within tunnels. Under IDA's 3G PCMTS QoS framework, mobile operators are required to achieve a service coverage of >95% and >99% for existing and new road and MRT tunnels respectively.

IDA's Performance Survey Period: Q1 2016

M1	Singtel Mobile	StarHub Mobile
Compliance standard: >95% for existing road and MRT tunnels; and >99% for all new road and MRT tunnels*		
Central Expressway (Road Tunnel)*		
Pass	Pass	Pass
Kallang-Paya Lebar Expressway (Road Tunnel)		
Pass	Pass	Pass
Fort Canning Tunnel (Road Tunnel)		
Pass	Pass	Pass
Woodsville Tunnel (Road Tunnel)		
Pass	Pass	Pass
Marina Costal Expressway (Road Tunnel)		
Pass	Pass	Pass
North South Line (MRT Tunnel)		
Pass	Pass	Pass
East West Line (MRT Tunnel)		
Pass	Pass	Pass
Circle Line (MRT Tunnel)		
Pass	Pass	Pass
North East Line (MRT Tunnel)		
Pass	Pass	Pass

M1	Singtel Mobile	StarHub Mobile
Downtown Line (MRT Tunnel)		
Pass	Pass	Pass

*Where deployment work for telecommunication infrastructure within the road and MRT tunnels was committed by mobile operators after January 2012, IDA will consider these tunnels to be new tunnels for the purpose of QoS measurements. Therefore, even though the Central Expressway is not a new road tunnel, the mobile operators have carried out upgrading works in the CTE after January 2012, and the higher standard of >99% applies. The rest of the tunnels listed above will continue to be subject to the standard of >95%.

Note: End users' individual experience may differ due to various reasons such as model of handset used, handset settings, number of users in the vicinity, etc. The tunnel service coverage results are based on IDA's coverage performance surveys.