

NZ Drivers' Readiness for CAVs

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CAVs – Connected and Autonomous vehicles

have the potential to improve road safety
and decrease congestion



- Reduce the road toll
- Decrease road infrastructure (e.g., traffic lights)
- Improve safety for pedestrian and cyclists
- Improve accessibility and mobility
- Eliminate the need for parking

Transport Futures, Ministry of Transport, 2016

CAVs may have other benefits as well

Shared autonomous vehicles could increase urban space by 15 percent

“making our cities greener, increase quality of life and also create the potential for additional housing”

Autonomous vehicles could slash road infrastructure costs

“if cars are able communicate with each other and negotiate their speed and safety distance, highway capacity could increase by up to a factor of 4”

Self-driving cars will be a potent weapon to combat climate change

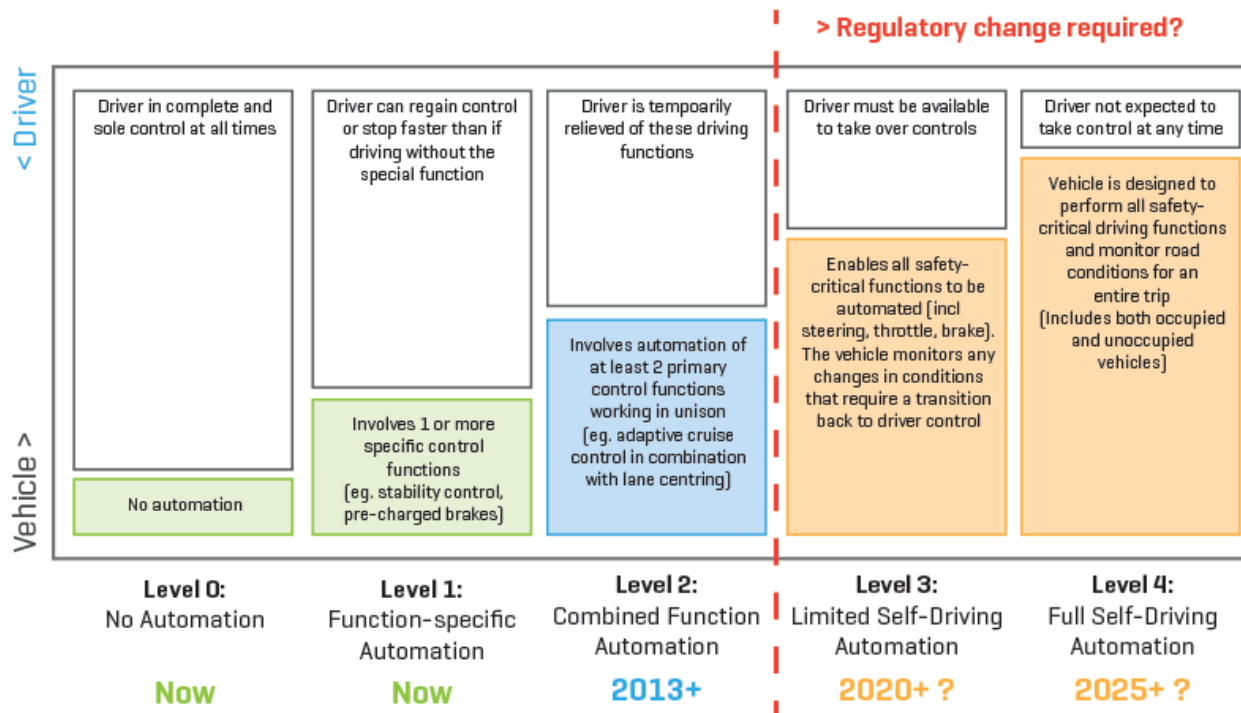
“driverless cars use roads more efficiently (fewer emissions because of less road construction), can reduce emissions by driving in convoys and don’t induce traffic jams”

Create more free time

“allowing drivers to safely use the journey time however they wish, from reading a book, to surfing the web, watching a film or just chatting face to face with other passengers”

How autonomous is autonomous?

Levels of driving automation (NHTSA)



Source: NHTSA (Modified)

When?

Uber fleet to be driverless by 2030

Uber CEO, Travis Kalanick, has indicated in a tweet that he expects Uber's fleet to be driverless by 2030. The service will be so inexpensive and ubiquitous that car ownership will be obsolete.



NuTonomy to provide self-driving taxi services in Singapore by 2018, expand to 10 cities around the world by 2020

Fully autonomous vehicles could be ready by 2025, predicts Daimler chairman

Jaguar and Land-Rover to provide fully autonomous cars by 2024

Tesla CEO expects true autonomous driving by 2023

BMW to launch autonomous iNext in 2021

First autonomous Toyota to be available in 2020

Driverless cars coming to showrooms by 2020 says Nissan's CEO

Ford CEO expects fully autonomous cars by 2020

Volkswagen expects first self driving cars on the market by 2019

Delphi and MobilEye to provide off-the-shelf self-driving system by 2019

Sergey Brin plans to have Google driverless car in the market by 2018

Next generation Audi A8 capable of fully autonomous driving in 2017



CAVs are on the way

What do road users think?

Schoettle and Sivak (2014) surveyed 1596 respondents across the UK, the US, and Australia

Familiarity: only 25% of respondents had heard about CAVs

Expected benefits: highest proportion of respondents (85.9%) expected fewer accidents (10% said mobility, and 6% said environmental benefits)

Price: 25% of respondents were willing to pay more than they do now for CAV technology (\$500 in US, \$455 in UK, and \$394 in Aus)

45.5% (US), 44.8% (UK), and 42.6% (AUS) of respondents did not want to pay anything extra

What do road users think?

KPMG focus group study of 32 participants in three US cities (2013)

Willingness: 23% of respondents in California willing to drive in CAVs, lower willingness in Illinois and New Jersey -respondents describing themselves as having “a passion to drive” were more willing to drive in CAVs

Respondents became more interested in CAVs when they were provided incentives, e.g., designated lane for CAVs, and much shorter commute times

Expected benefits: female respondents noted self-driving would allow them to focus on children, enjoy an evening out without worrying about having a drink with dinner, and mobility benefits for disabled

Male participants were more likely to resist because of being forced to stay in a lane and follow speed limits

Price: The oldest participants (60+ year-old) and the youngest (21–34 year-olds) expressed the highest willingness to pay in order to obtain self-driving technologies

What do road users think?

Payre, Cestac, & Delhomme (2013) survey of 421 French drivers
(153 males)

Willingness: 68% of respondents were willing to drive in CAVs
71% would be interested in using CAVs when impaired

Respondents were most interested in using CAVs on monotonous highway drives, in stressful traffic congestion and for automatic parking
Men had more positive attitudes towards CAVs than women

Price: Respondents were willing to spend on average 1,624€ (\$2,484 NZD) beyond the price of their current car to purchase a CAV, (min = 0, max = 10,000€)

What do road users think?

Bansal, Kockelman, & Singh (2016) Qualtrics survey of 347 drivers
in Austin, Texas

Willingness: 80% had heard of Google's self-driving car

30% showed interest in using CAVs as soon as they are available for mass market sales

19% of respondents were not at all interested in owning Level 4 CAVs

Expected benefits: reduction in crashes seen as greatest CAV benefit (63%)

31% of respondents did not believe that CAVs would relieve traffic congestion

70% of respondents would like to ride in CAVs on high-speed highways, and congested traffic, while only 46% would let the vehicles drive themselves on city streets

Price: Respondents were willing to spend on average \$7,253 USD (\$10,154 NZD) beyond the price of their current car to purchase a CAV

Only 15% and 3% of respondents expected to use Shared Autonomous Vehicles (SAVs) once a week at a cost of \$2 per mile and \$3 per mile, respectively. 41% would use SAVs once a week or more at \$1 per mile

(Respondents told that Taxis in Austin cost \$2.50-\$3.50 per mile and Uber \$1.50 per mile)

Current Study: Will Kiwis want to use CAVs?

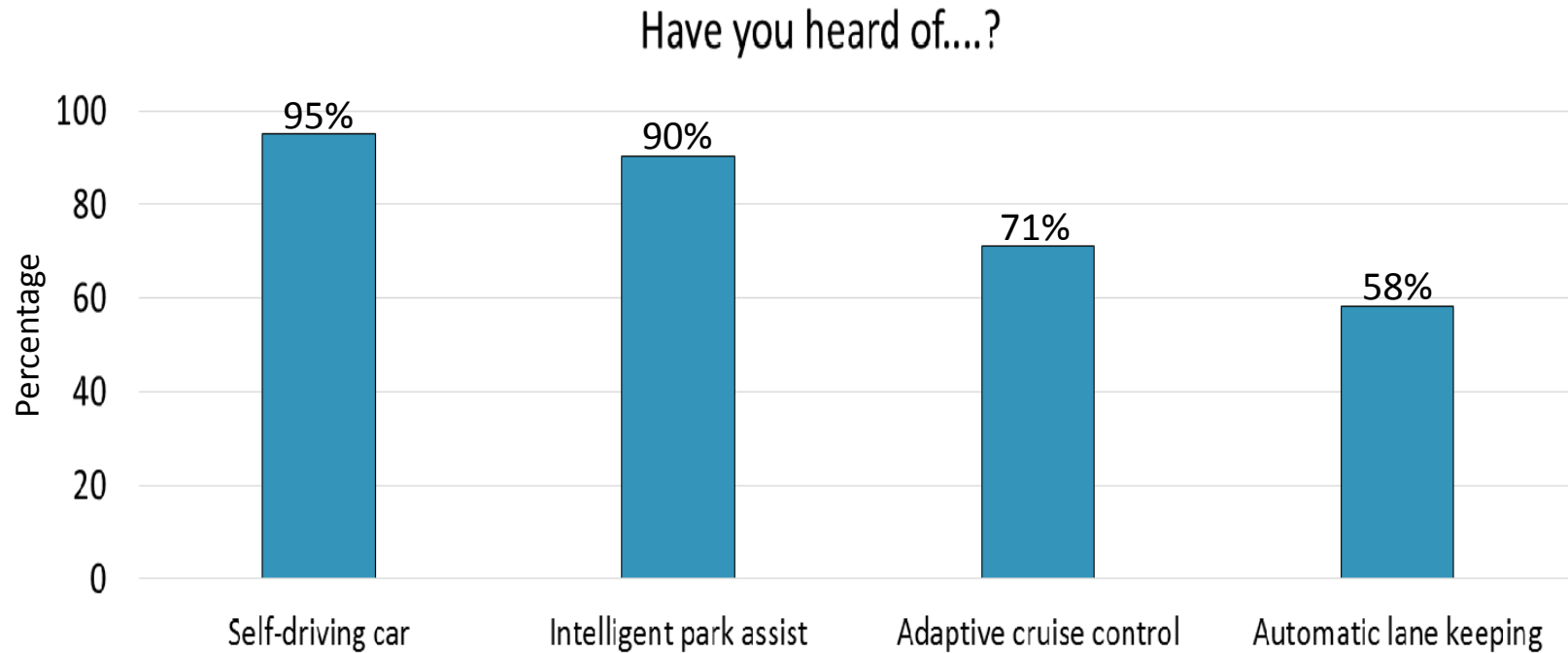
Aim: To explore New Zealand drivers' views and attitudes about CAVs

Method: 1,067 respondents (55% female; avg. age 49.1; 16-88 years) responded to a Qualtrics online questionnaire focusing on:

- Knowledge and current use of automated driving technologies
- Perceptions of enjoyment, safety and interest related to various levels of automation
- When and why they would use a fully automated vehicle
- Perceptions of the risks and benefits of CAVs
- Willingness to pay

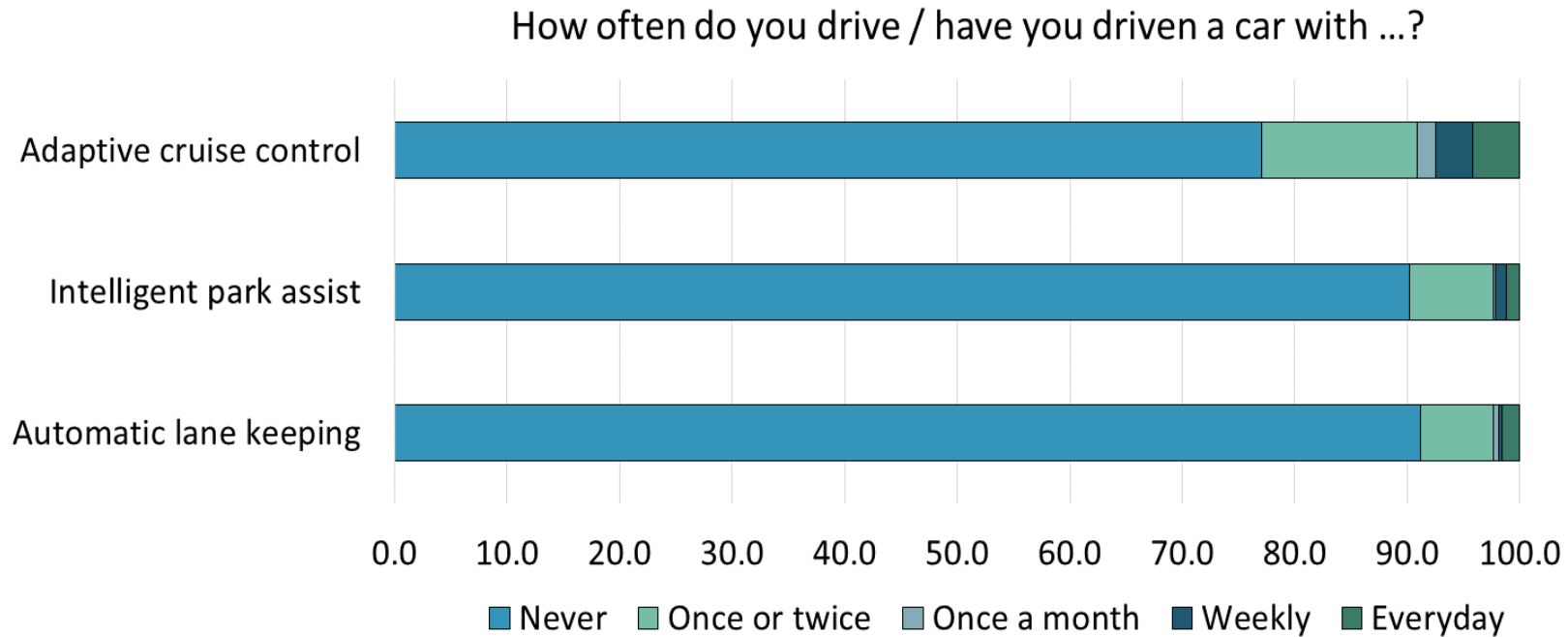
Familiarity

Nearly all respondents had heard about the Google self-driving car, less had heard of other common types of driver assistance



Familiarity

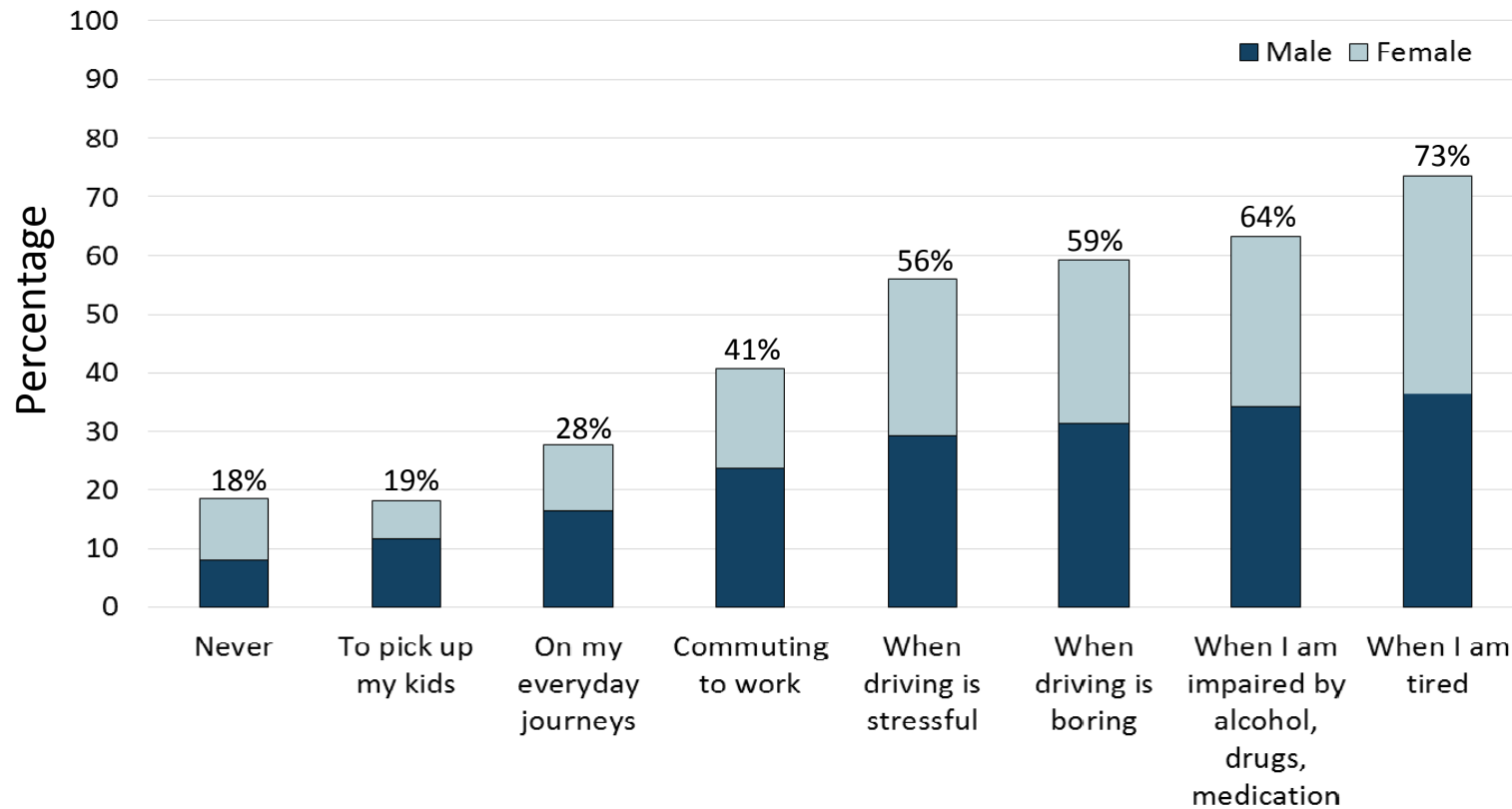
Having heard of the technology is not the same as having used it



Willingness

Willingness to use CAVs is situational

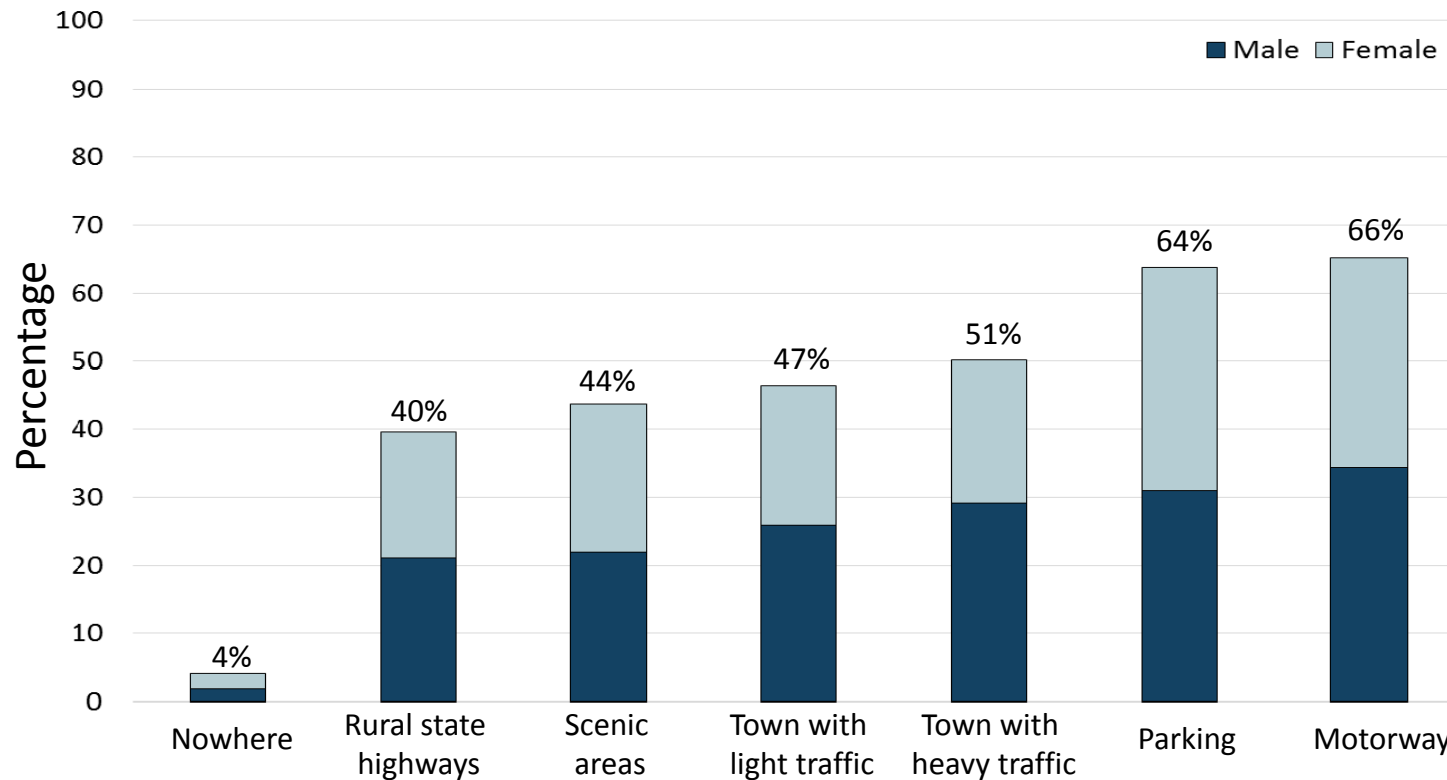
On which occasions would you like to drive in a fully automated car?



Willingness

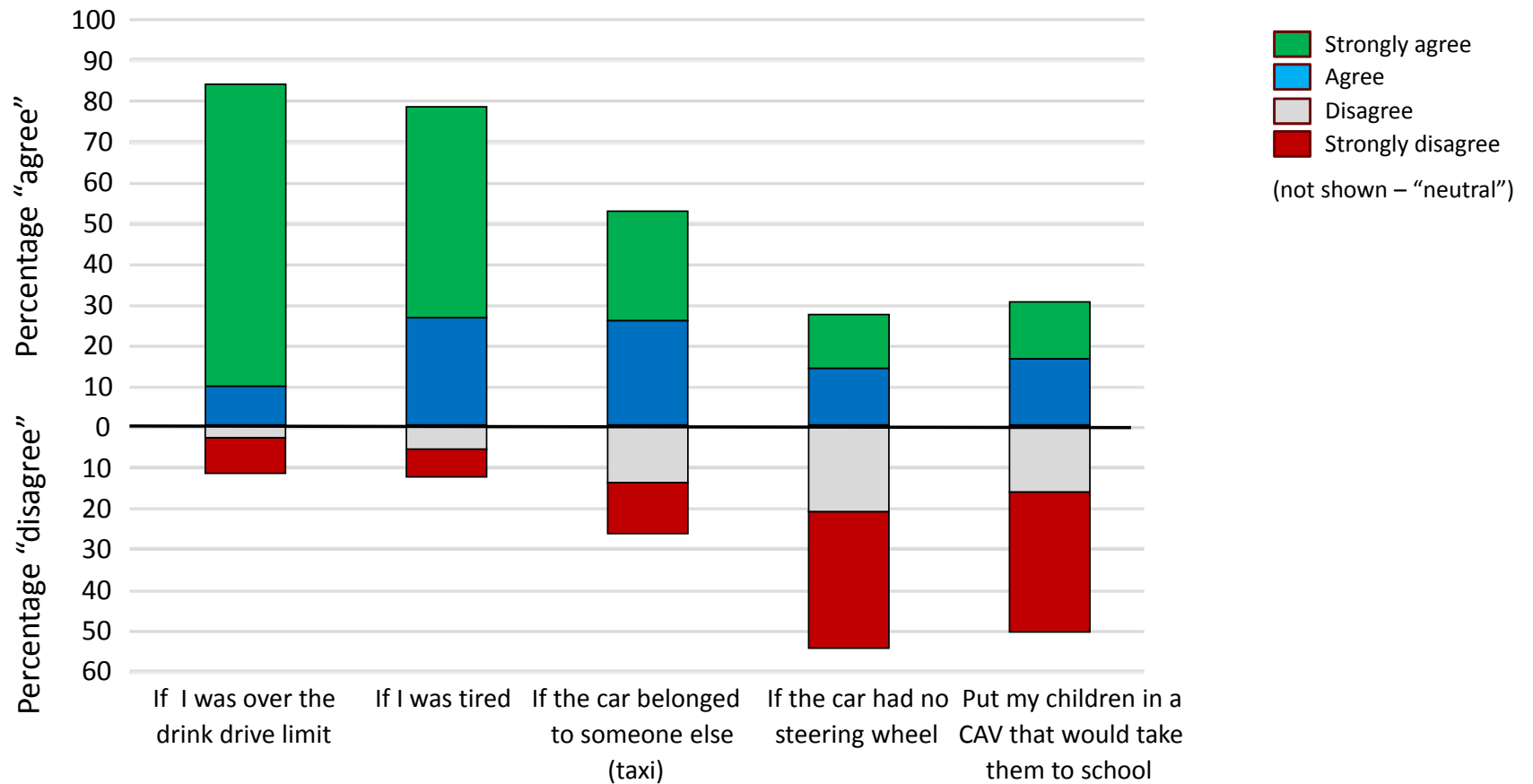
Willingness to use CAVs is situational

Where would you would let your car drive itself?



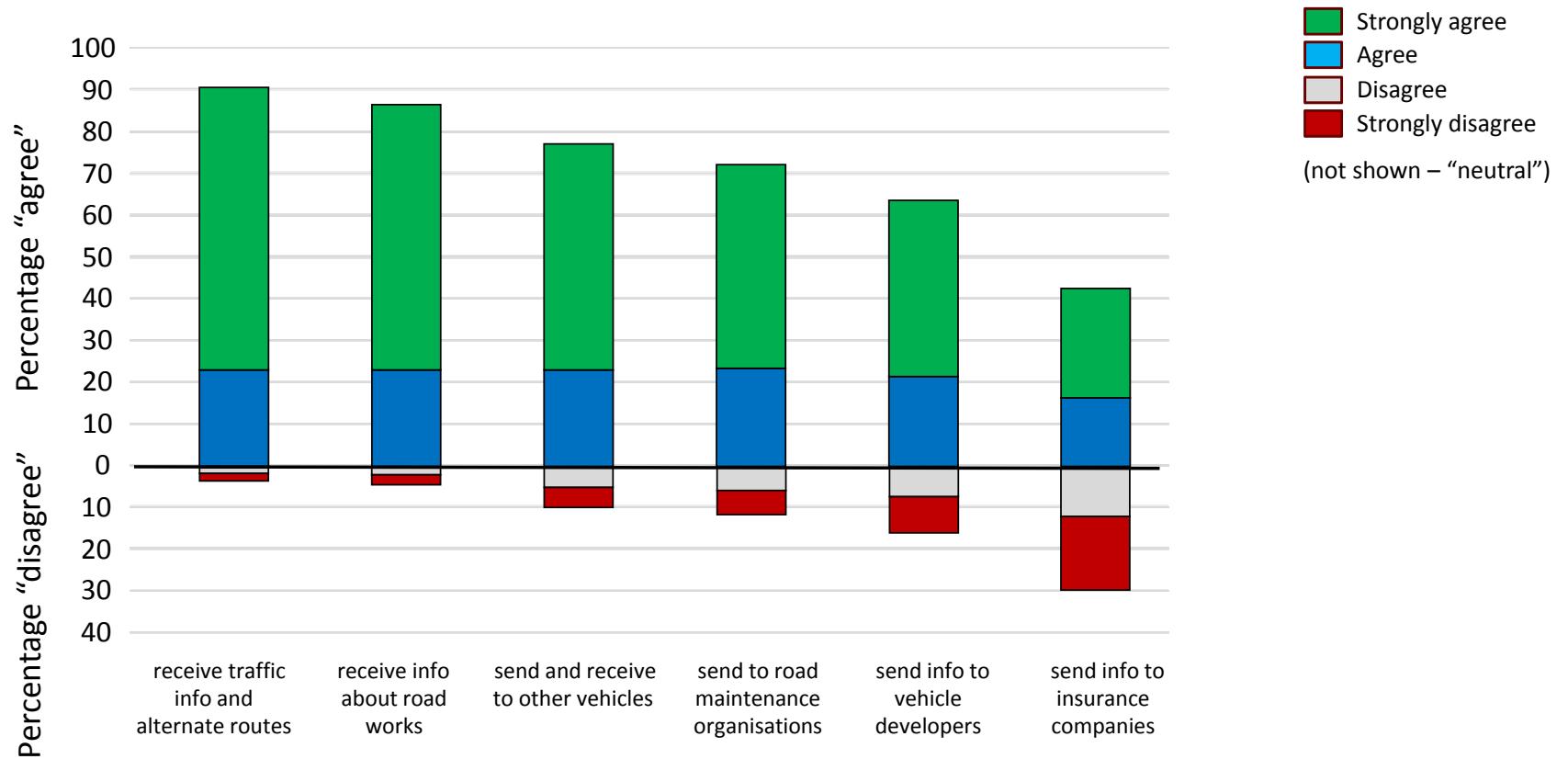
Willingness

I would be willing to use a fully automated car ...



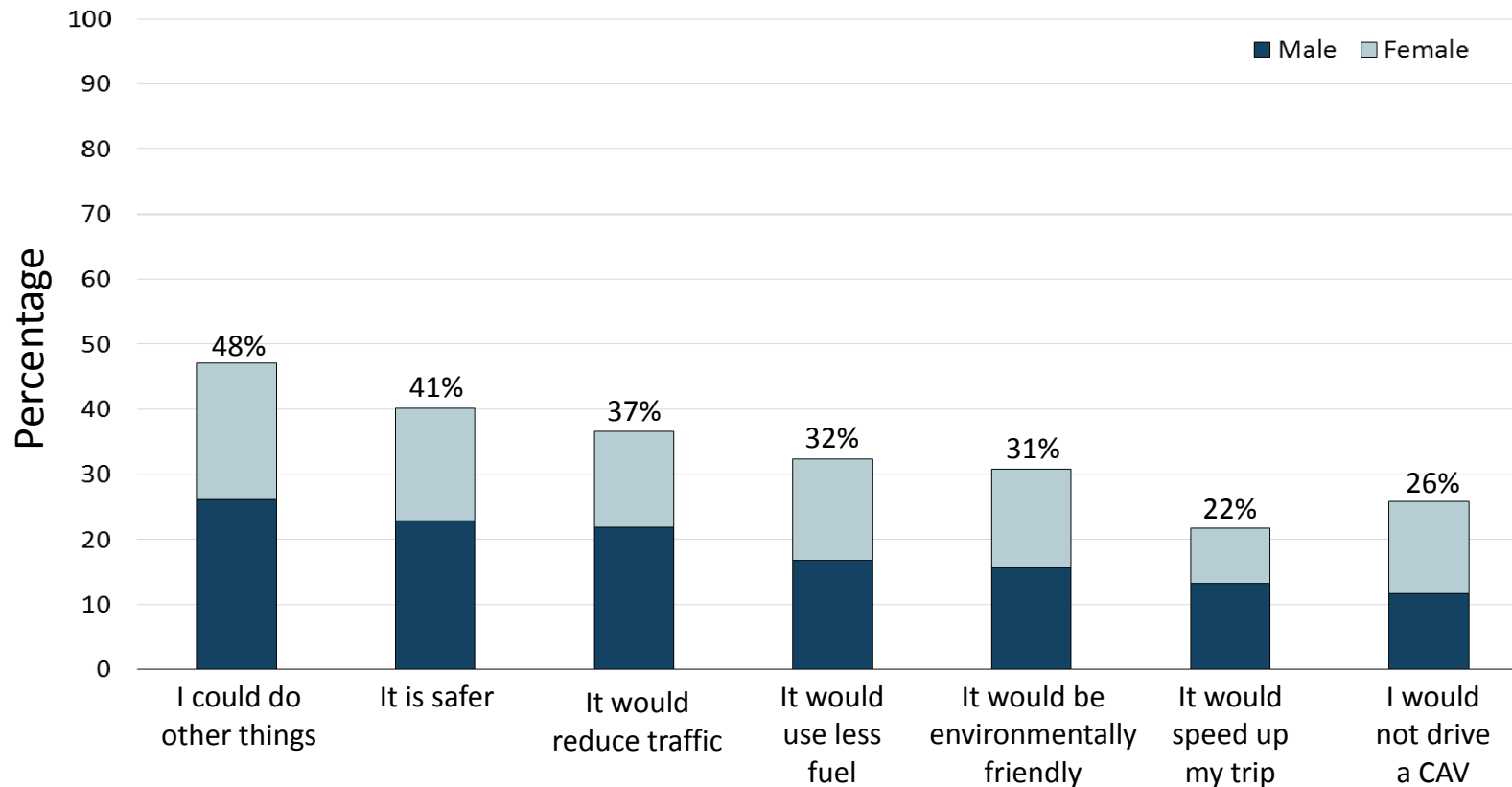
Willingness

I would be willing to let my car connect to ...



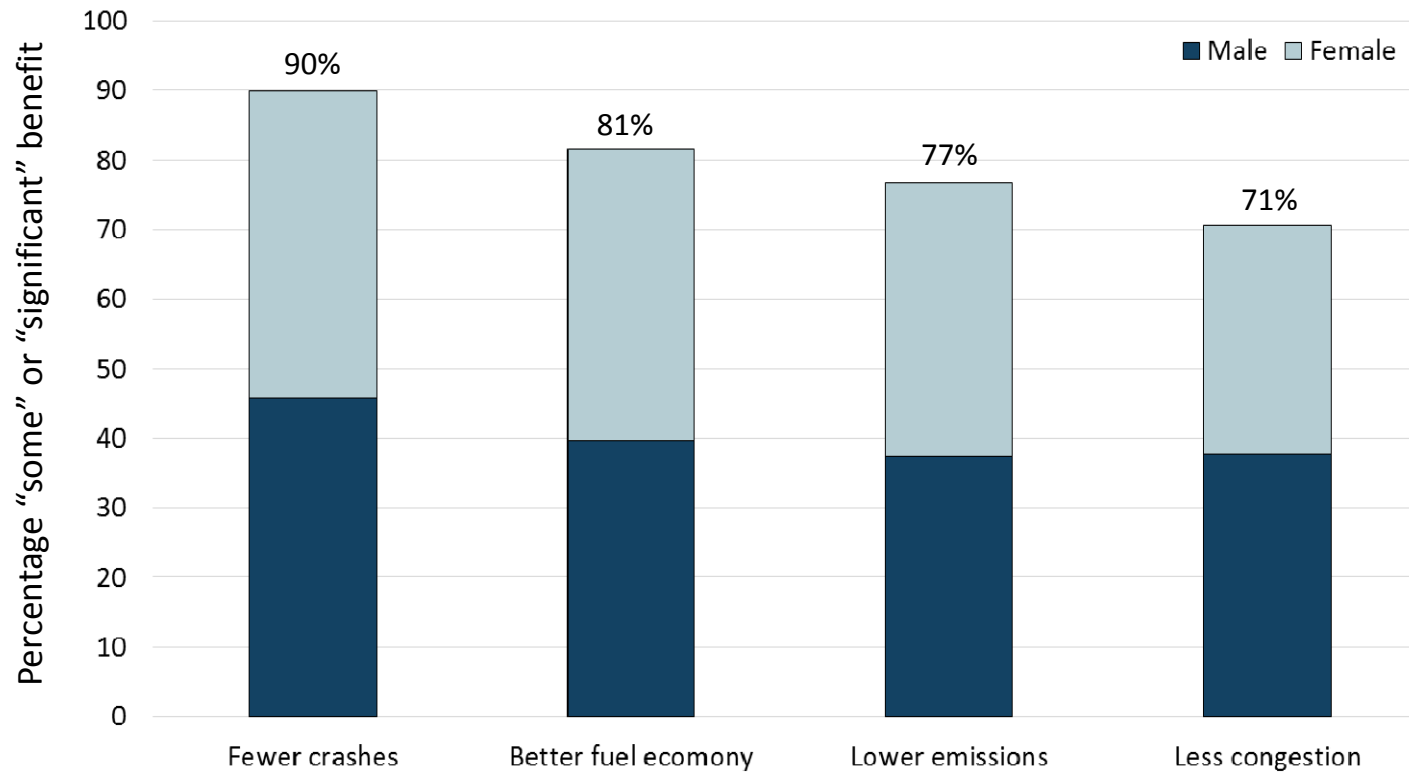
Reasons

Why would you like to drive a fully automated vehicle? ...



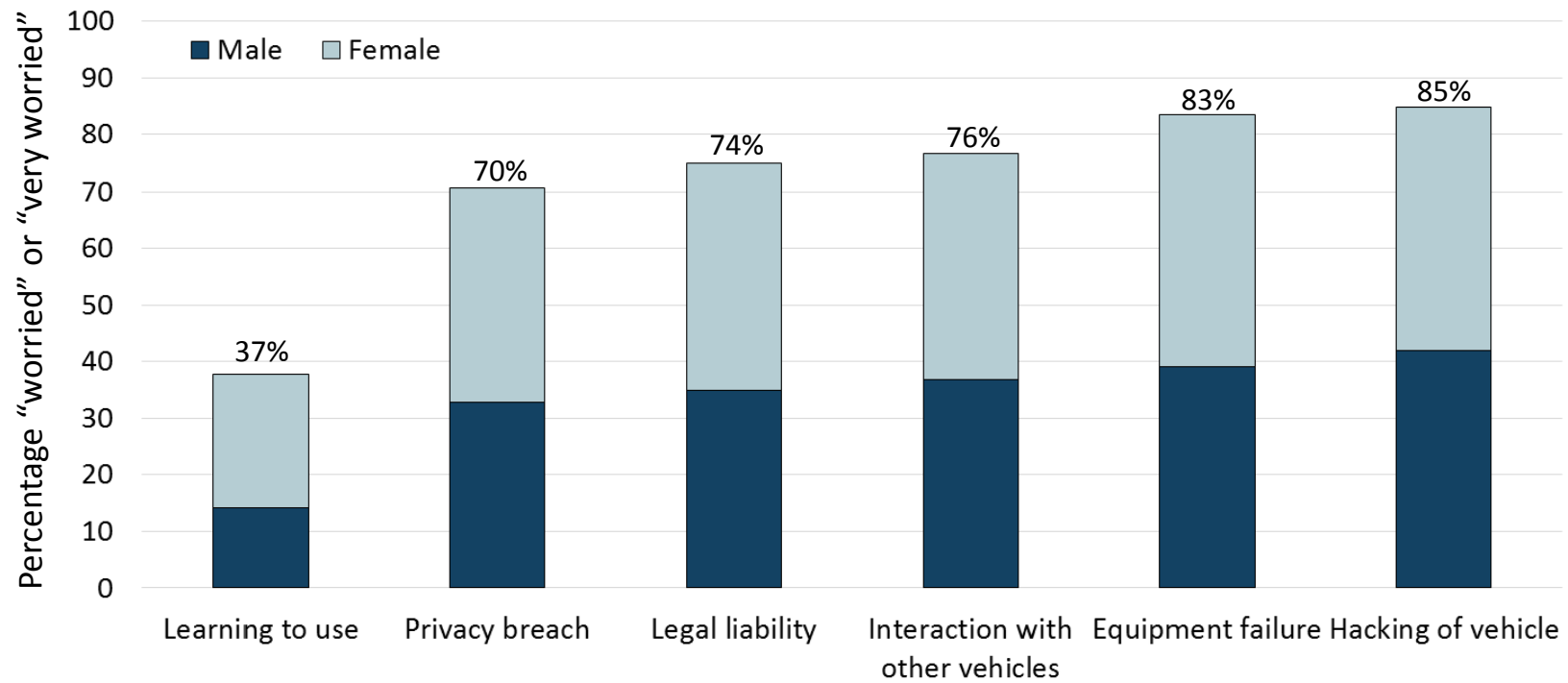
Benefits

What are the potential benefits of CAVs? ...



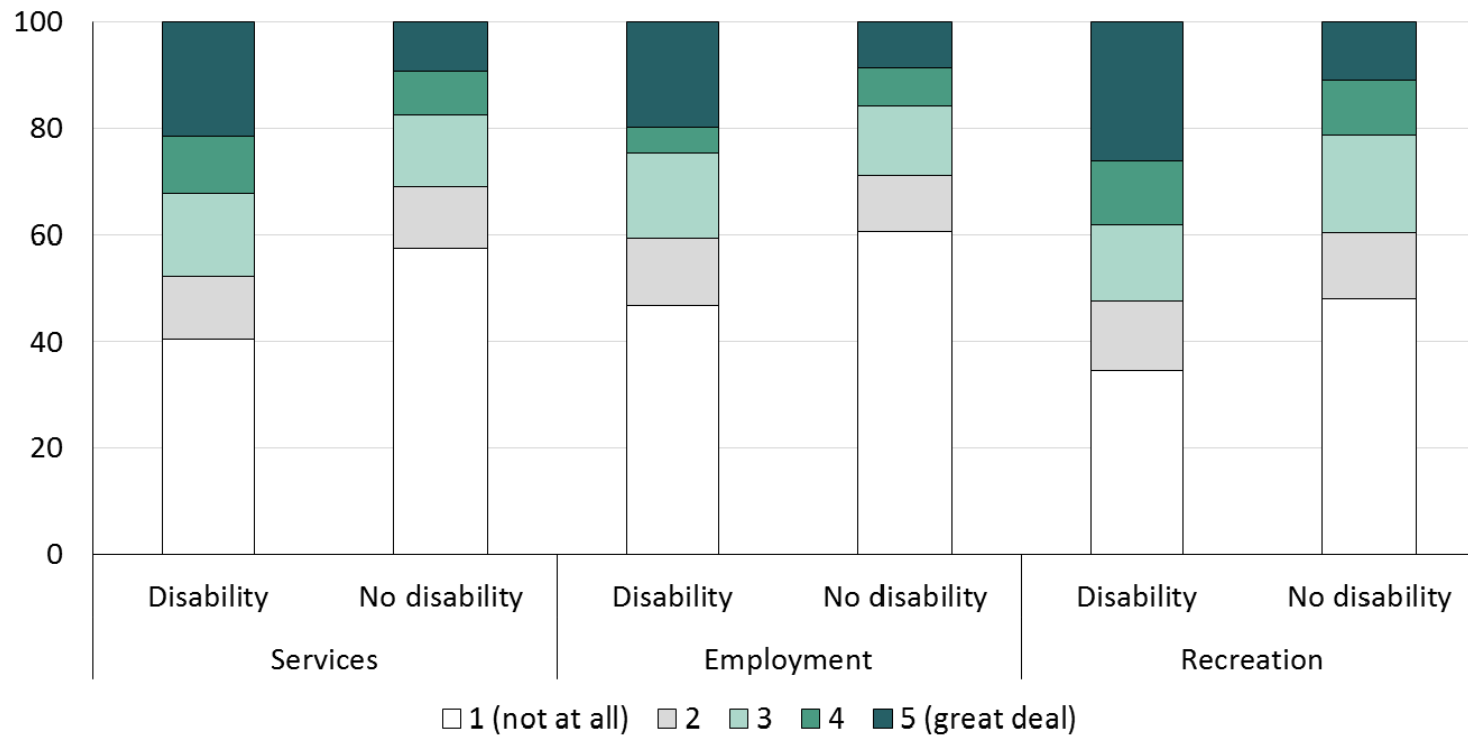
Concerns

How concerned are you about ...



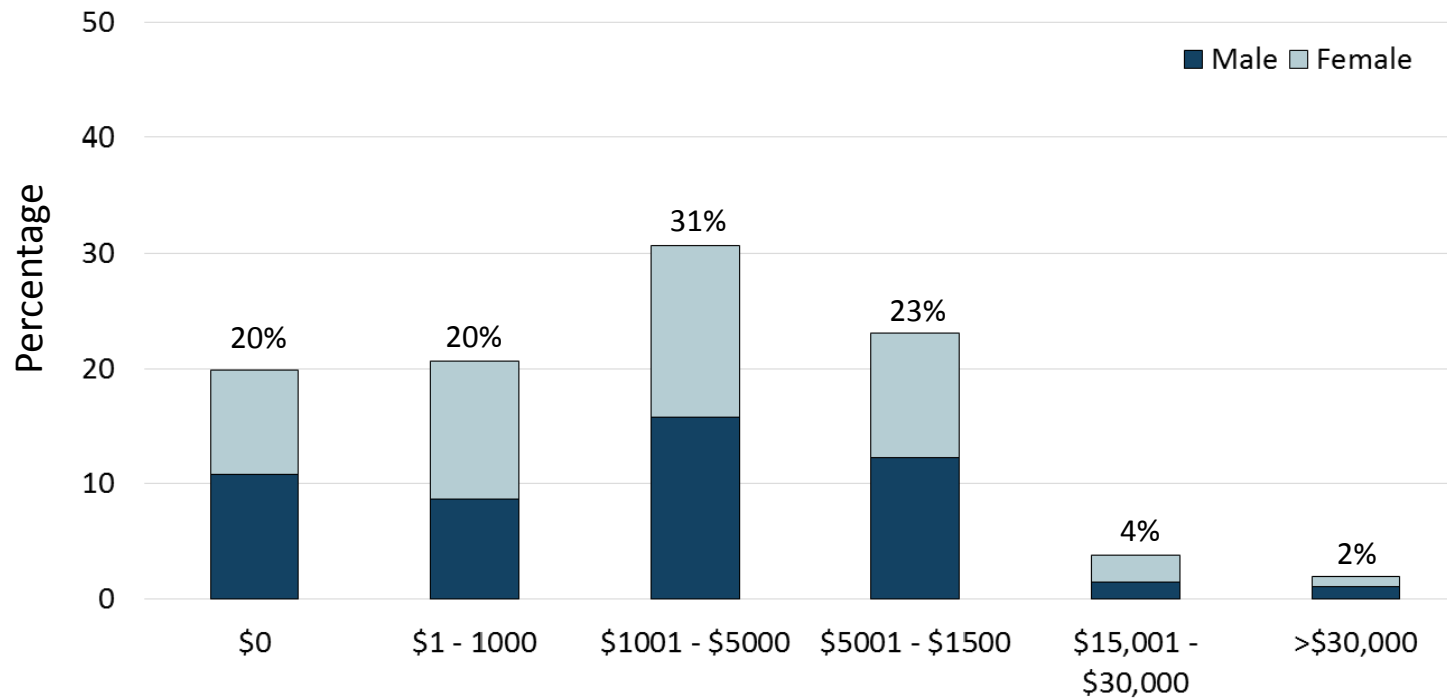
Accessibility

Rate the degree to which an autonomous vehicle would improve your access to...



Price

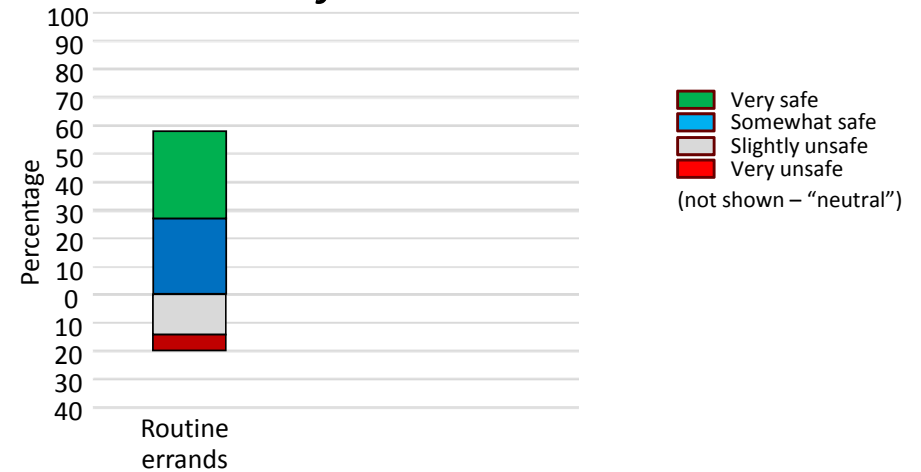
How much more would you pay for a fully automated car?



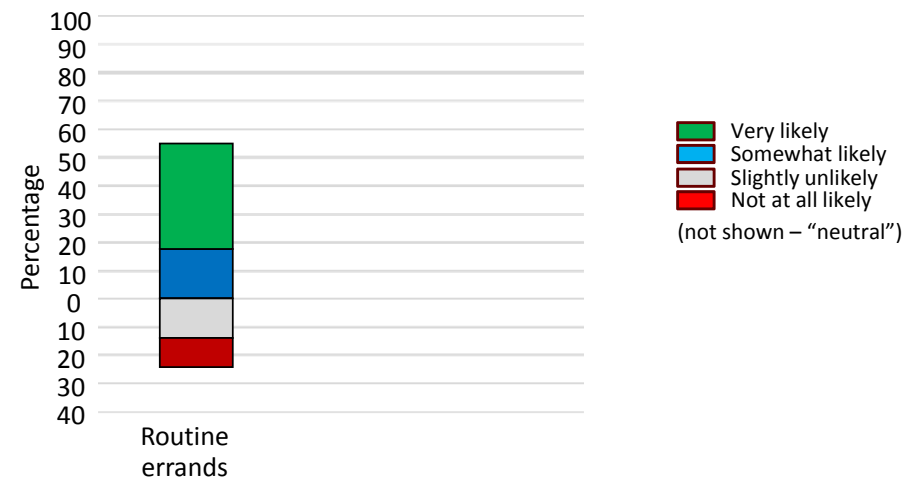
Imagine scenarios

Imagine driving around town on routine errands. Steering is controlled by an Automatic Lane Keeping System, and speed controlled by Adaptive Cruise Control (the driver doesn't have to worry about exceeding the speed limit or maintaining distance to the car in front). Compared to a completely manual car ...

How safe?

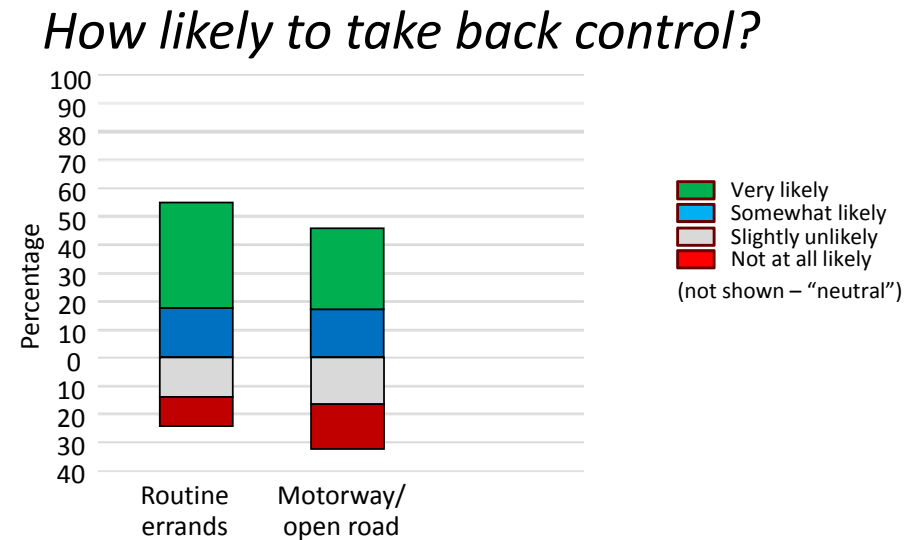
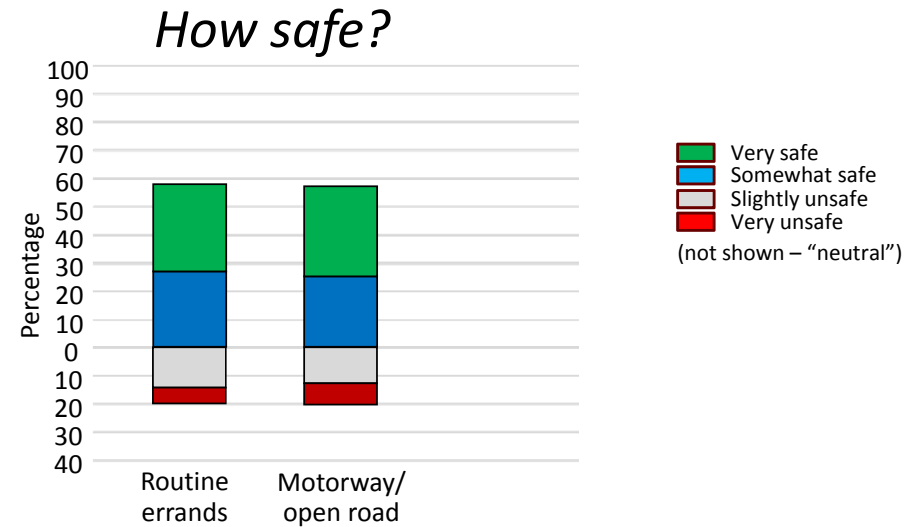


How likely to take back control?



Imagine scenarios

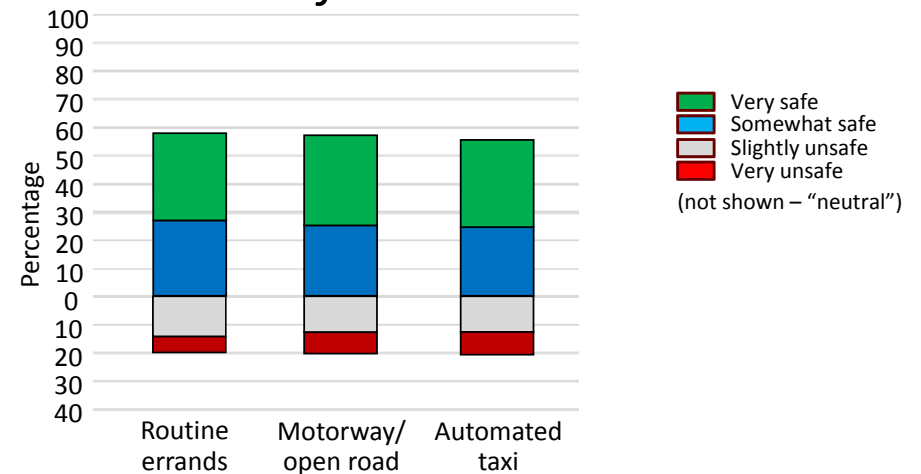
Imagine driving on a motorway or open roads such that driving is hands-free. Steering is controlled by an Automatic Lane Keeping System, and speed...



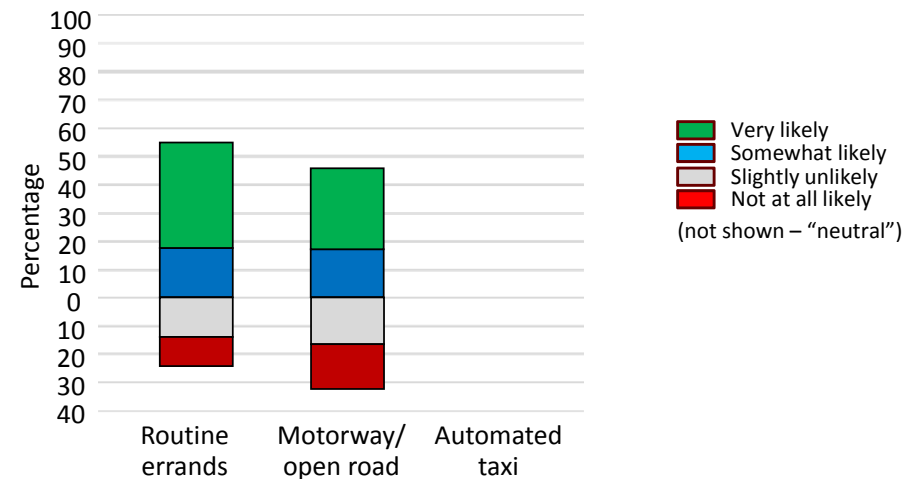
Imagine scenarios

*Imagine needing to travel to a busy urban area. Once you telephone or text a request for a ride, a **fully automated car comes to collect you**, all you need to do is provide the address of your destination. Billing is automatic and **you are not in control at any time.***

How safe?



How likely to take back control?



Summary I

Most NZ drivers have heard of self driving cars, but other driver assistance technology is not well understood (or used)

Greatest perceived benefit was potential reduction in crashes (same as overseas studies)

Increased access to employment, services, and recreation also seen as a significant benefit

Highest likely use of automation was for motorway and parking or when driver was tired or impaired by alcohol or drugs (same as overseas studies)

Summary II

Around half of the respondents thought that using a fully autonomous vehicle would be enjoyable and safe, but also thought they would be likely to switch to manual control

Approximately 1 in 5 said they would not use a CAV

Vehicle data connectivity was generally acceptable, except with insurers

Willingness to pay was very low

Conclusion

Widespread belief that CAVs will be safer

“...it is not clear *a priori* whether computational speed, constant vigilance, and lack of distractability of self-driving vehicles would trump the predictive experience of middle-aged drivers”.

(Sivak & Schoettle, 2015)



The Paradox of Automation

As the level of automation is increased, so are the consequences of each human error

Other benefits of CAVs (efficiency, economy, accessibility) need emphasis in order to maintain wide-spread acceptance (in the face of inevitable collisions)

Integration of CAVs with other road users is key to success