College of Human and Health Sciences
Coleg y Gwyddorau Dynol ac Iechyd
Centre for Innovative Ageing

Swansea University
Prifysgol Abertawe

Innovation in older people's driving safety

Dr Charles Musselwhite

Associate Professor in Gerontology

Centre for Innovative Ageing, Swansea University

Email: c.b.a.musselwhite@swansea.ac.uk

Twitter: @charliemuss
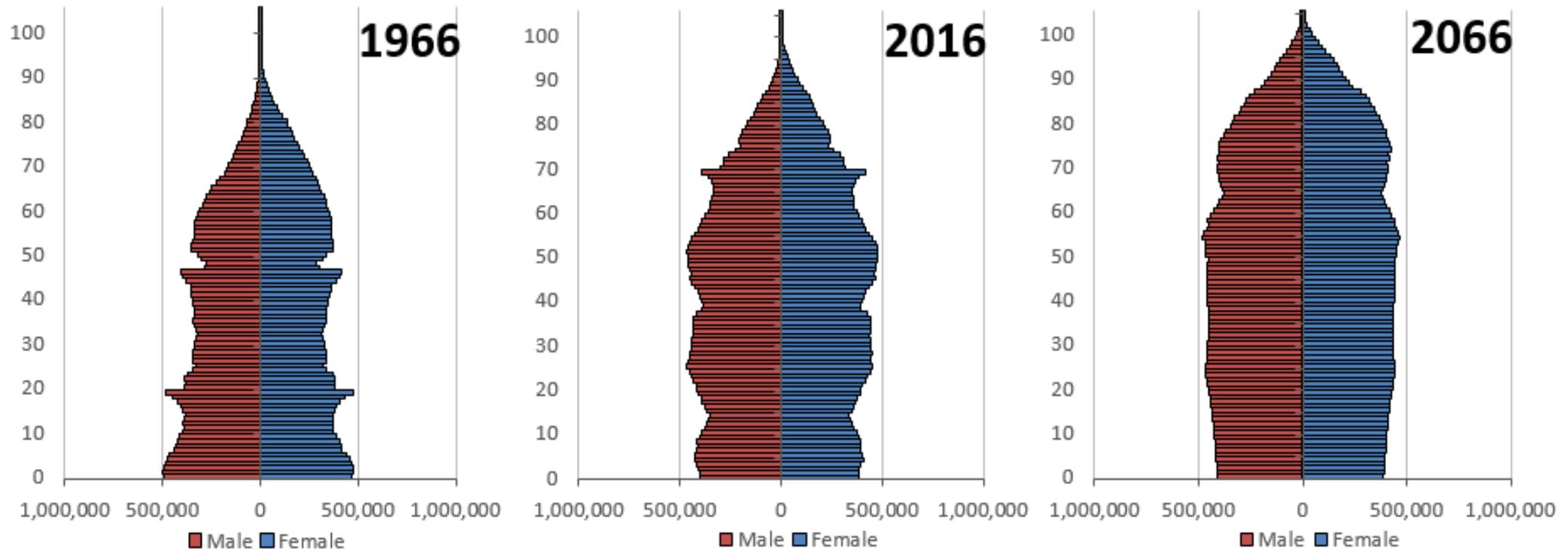
Website: www.drcharliemuss.com

- Ageing and mobility

- Older driver safety

- Safety entwined with social aspects of mobility

- Innovation 1: compensatory behaviour

- Innovation 2: Substituting literal mobility

- Innovation 3: vehicle innovation

- Conclusion

College of Human and Health Sciences
Coleg y Gwyddorau Dynol ac Iechyd
Centre for Innovative Ageing

Swansea University
Prifysgol Abertawe

Ageing population UK

College of Human and Health Sciences
Coleg y Gwyddorau Dynol ac Iechyd
Centre for Innovative Ageing

Swansea University
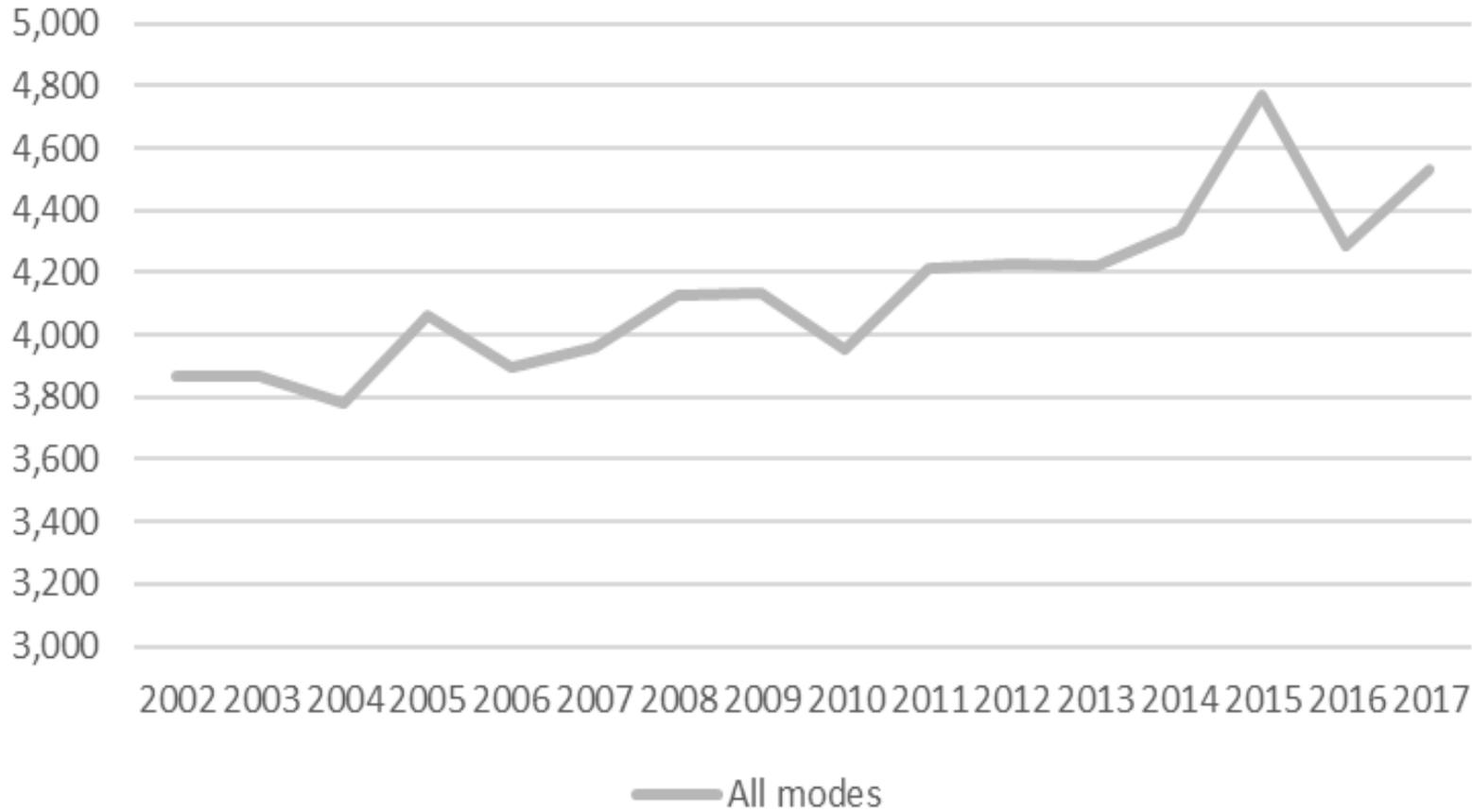Prifysgol Abertawe

Percentage of people expected to survive to age 100 by year of birth, 1981 to 2066, UK
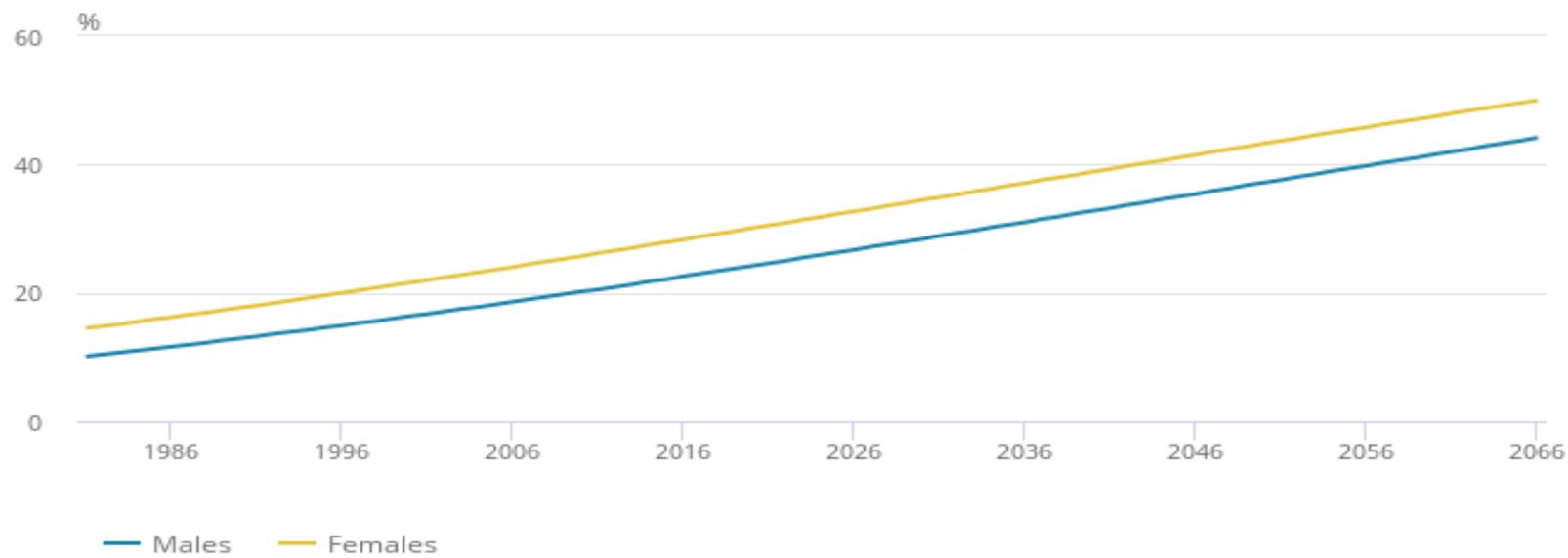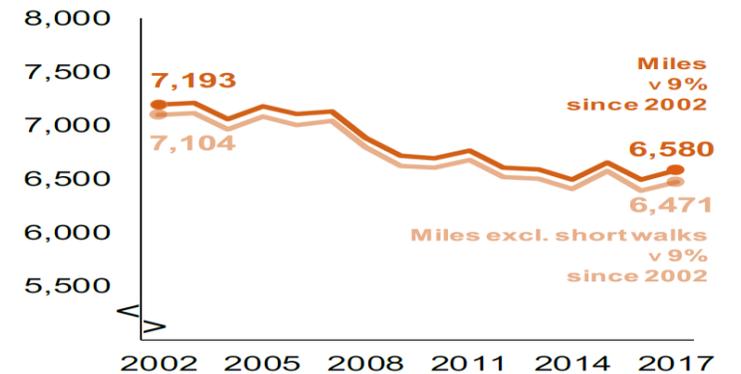

Source: Past and projected data from the period and cohort life tables, 2016-based, UK, Office for National Statistics

Miles per person per year over 70s - All modes

5,000	
4,800	
4,600	
4,400	
4,200	
4,000	
3,800	
3,600	
3,400	
3,200	
3,000	

2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017

—— All modes

Distance
Average miles travelled per person per year

7,193

7,104

Miles
v 9%
since 2002

6,580

6,471

Miles excl. short walks
v 9%
since 2002

8,000
7,500
7,000
6,500
6,000
5,500

2002   2005   2008   2011   2014   2017

% licence holder by age
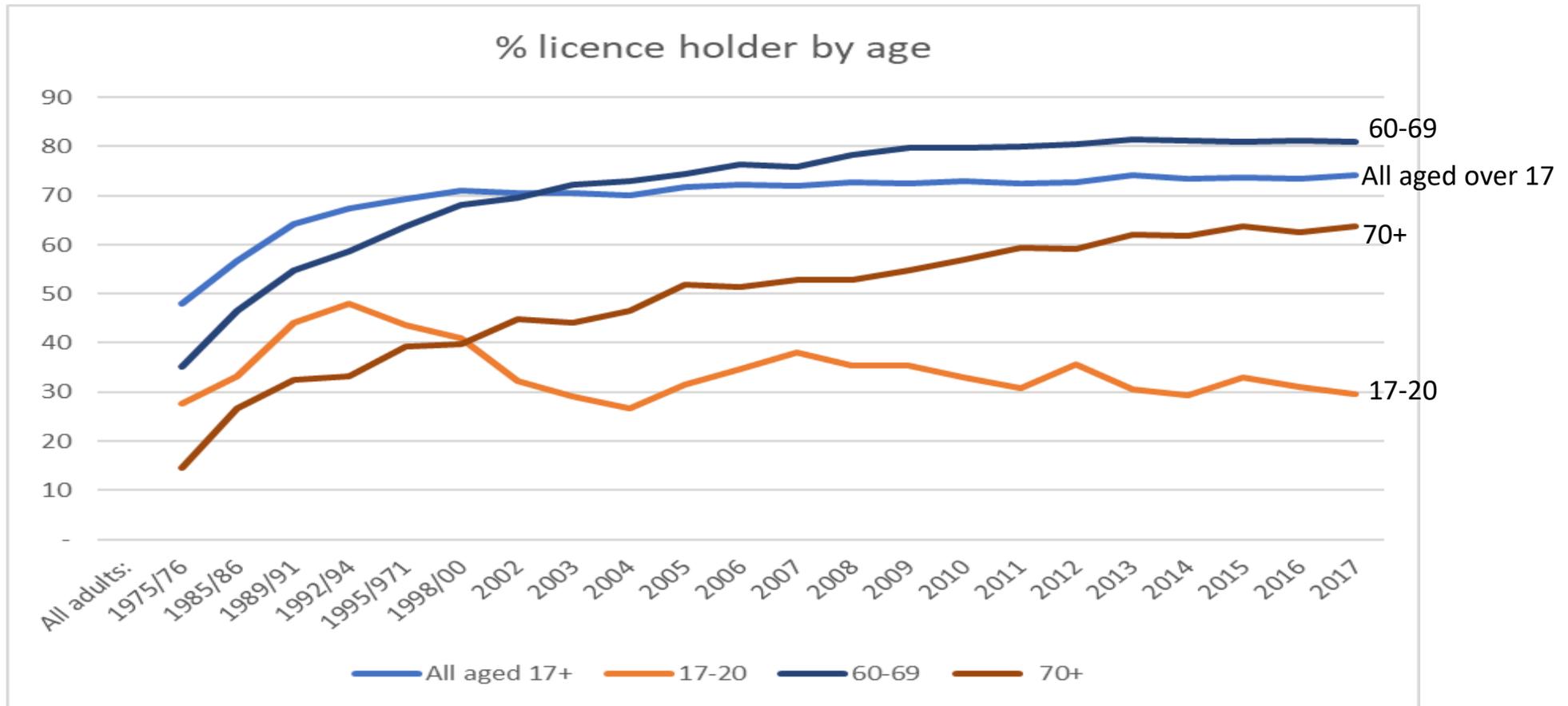
The desire to get out and about does not diminish in older age, nor does the variety of activities people like to do outdoors.

- More older people, who are more mobile and more likely to drive than ever before

- Mobility is important for health but particularly giving up driving is related to:
  - a decrease in wellbeing
  - an increase in depression and related health problems, including feelings of stress, isolation and increased mortality

- **A major life event**

- **Why?**

With car

"If I wake up and I want to go and see the mountains I just can with a car. I decide" (male, aged 80, car driver)

TERTIARY MOBILITY NEEDS
Aesthetic Needs
e.g. The need for the journey itself, for relaxation, visit nature.
No explicit purpose.

"It means I can help the family. I can pick up grandkids. I can be grandma for them" (female, aged 80, car driver)

"The freedom of the open road is still there you know. We were sold this in the 60s and I still feel it now!" (male, car driver, aged 77)

SECONDARY MOBILITY NEEDS
Social/affective Needs
e.g. The need for independence, control, to be seen as normal.
Linked to status, roles, identity, self-esteem. Impression management

"Well I get all my stuff in because I can drive God knows what I'd do without the car. The supermarket is so far away you see." (female, 78, car driver)

PRIMARY MOBILITY NEEDS
Practical/utilitarian Needs
e.g. get from A to B as safely, reliably, cheaply and comfortably as possible.

Musselwhite, C. and Haddad, H. (2010). Mobility, accessibility and quality of later life. *Quality in Ageing and Older Adults*. **11(1),** 25-37.
Musselwhite, C.B.A. and Haddad, H. (2018). Older people's travel and mobility needs. A reflection of a hierarchical model 10 years on. *Quality in Ageing and Older Adults*, 19(2), 87-105

Are older drivers safe?
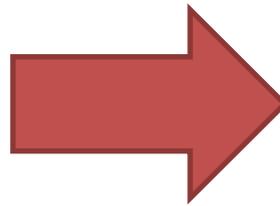
- **Changes in cognition**
  - Selective and sustained attention, perceptual speed, working memory, task switching, cognitive overload (see Musselwhite, 2017 for review)

- **Changes in eyesight**
  - Between the ages of 15 and 65 years, susceptibility to glare increases, and recovery form glare increases from two to nine seconds (DfT, 2001).
  - Research suggests that by the age of 75 years old drivers may require 32 times the brightness they did at the age of 25 in order to be able to see effectively.

- **Changes in mobility**
  - Less mobility in neck, leg, knees, hips.
  - Fatigue

- **Not having full awareness to make decision**

- **Looked, didn't see.**

- **Gap acceptance**
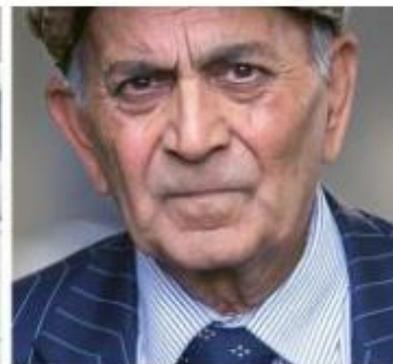
- **Being distracted**

- **Reaction times:**
  - Reaction time shortens from infancy to around 20 years of age, then increases slowly to around 70 years of age and beyond (Der and Deary, 2006; Jevas and Yan, 2001; Welford, 1977).

  - A person over the age of 65 can have reactions times up to 22 times slower than that of someone of 30 years of age (see DfT, 2001; Hultsch, et al., 2002)
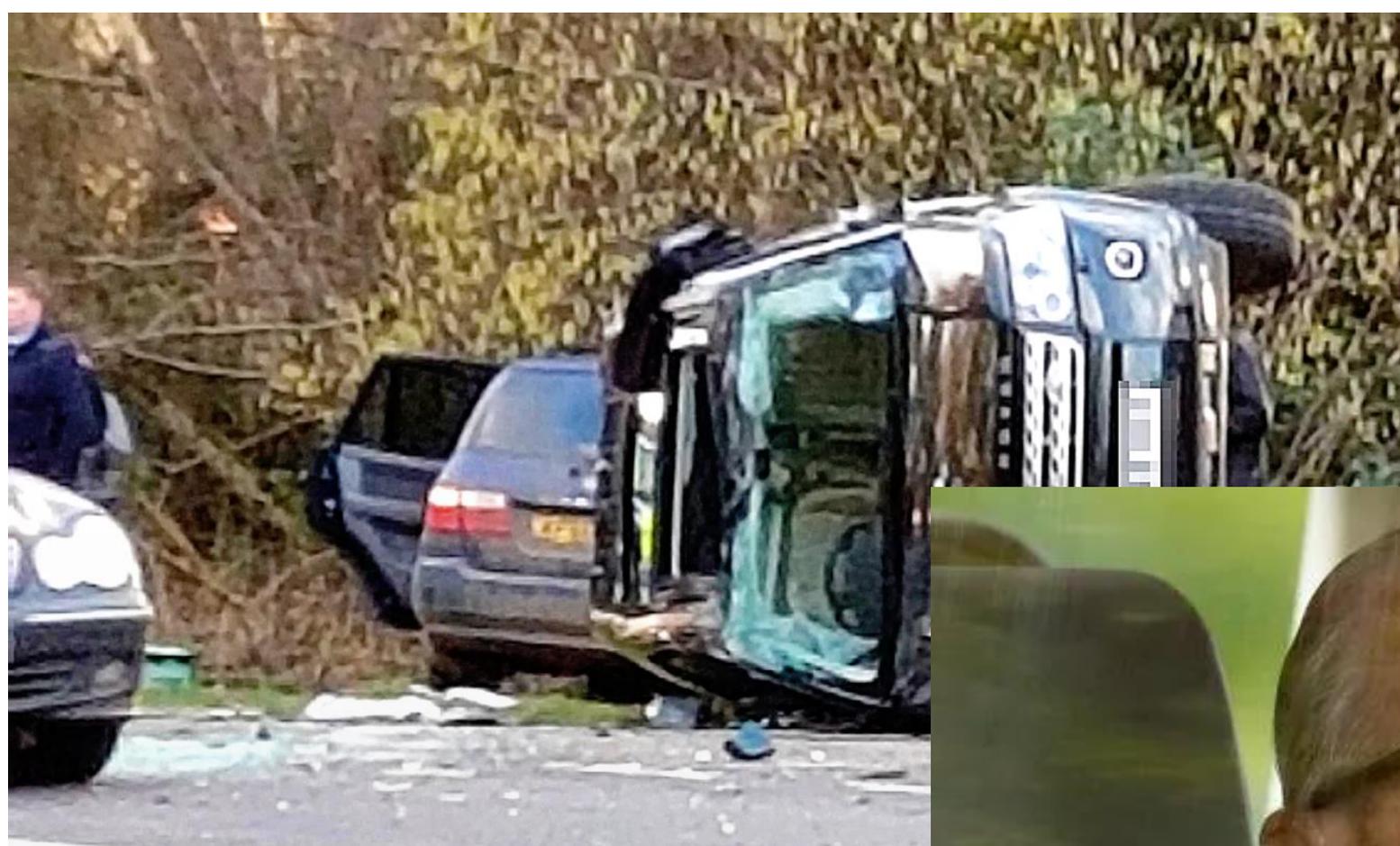
Bus driver, 77, in fatal crash had worked 70-hour week

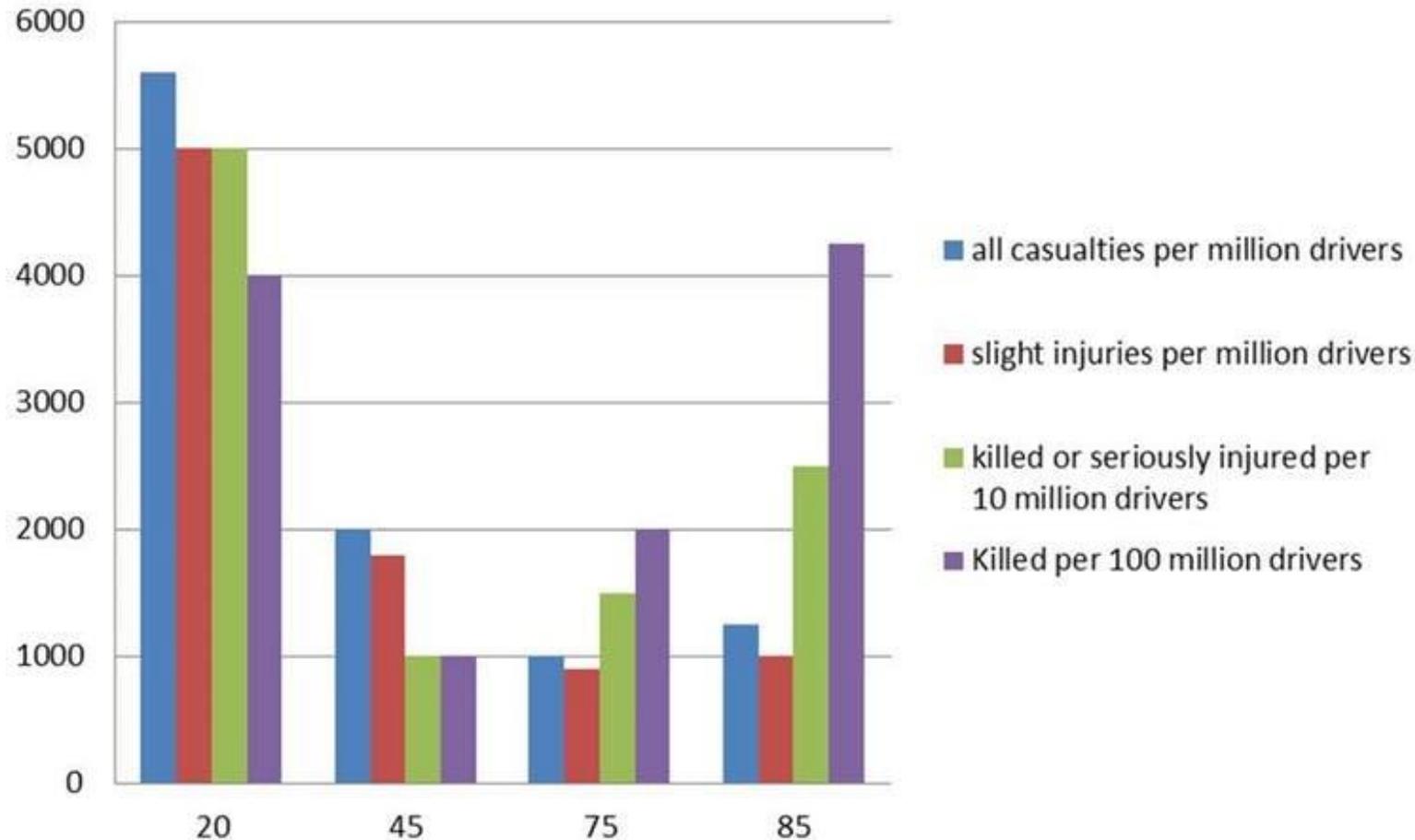The bus, driven by Kailash Chander, above right, killed Rowan Fitzgerald when it careered into a supermarket

British couple from High Wycombe named as pensioners who died after driving caravan wrong way down motorway

f share 🐦 ✉

Yet, older drivers on the whole are safe drivers

Road traffic collisions per driver by age (Great Britain, 2014)

Legend:
- all casualties per million drivers
- slight injuries per million drivers
- killed or seriously injured per 10 million drivers
- Killed per 100 million drivers

- When older drivers are involved in a crash, the likelihood of them dying or being seriously injured is up to four times higher simply because of their frailty, particularly women over 70.

Mitchell, C.G.B. (2018). Are Older People Safe Drivers on the Roads, Testing and Training? In C.Musselwhite (ed.) Transport, Travel and Later Life (pp. 37–63). Bingley: Emerald Publishing Limited

Innovation 1: Compensatory behaviour

- **Changes in cognition**
  - Selective and sustained attention, perceptual speed, working memory, task switching, cognitive overload (see Musselwhite, 2017 for review)

- **Changes in eyesight**
  - Between the ages of 15 and 65 years, susceptibility to glare increases, and recovery form glare increases from two to nine seconds (DfT, 2001).
  - Research suggests that by the age of 75 years old drivers may require 32 times the brightness they did at the age of 25 in order to be able to see effectively.

- **Changes in mobility**
  - Less mobility in neck, leg, knees, hips.
  - Fatigue

Compensatory behaviour – reducing use in:

- Rush hour
- Bad weather
- Making difficult turns
- Motorway driving
- Driving slower, taking time

Not having full awareness to make decision

Looked, didn't see.

**Gap acceptance**

Being distracted

Reaction times:
  - Reaction time shortens from infancy to around 20 years of age, then increases slowly to around 70 years of age and beyond (Der and Deary, 2006; Jevas and Yan, 2001; Welford, 1977).

  - A person over the age of 65 can have reactions times up to 22 times slower than that of someone of 30 years of age (see DfT, 2001; Hultsch, et al., 2002)
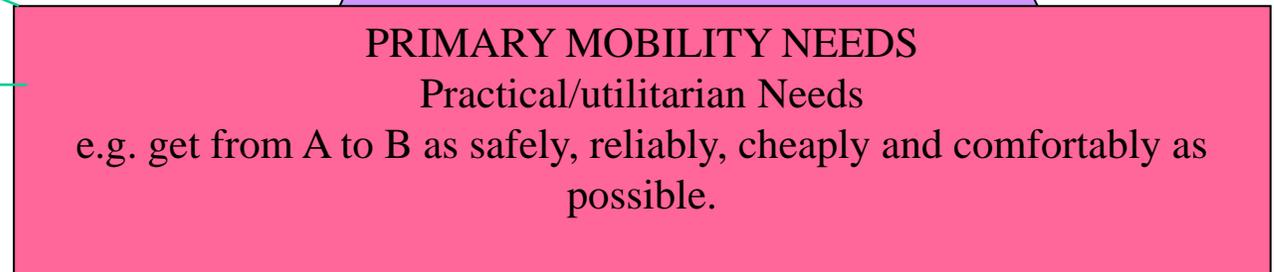
Innovation 2: Substitute literal mobility

"It's great to see the places I grew up in on those webcams. Some haven't changed much at all. I love using them! I don't suppose I shall go back there but I can still see it" (male, aged 80, walker)
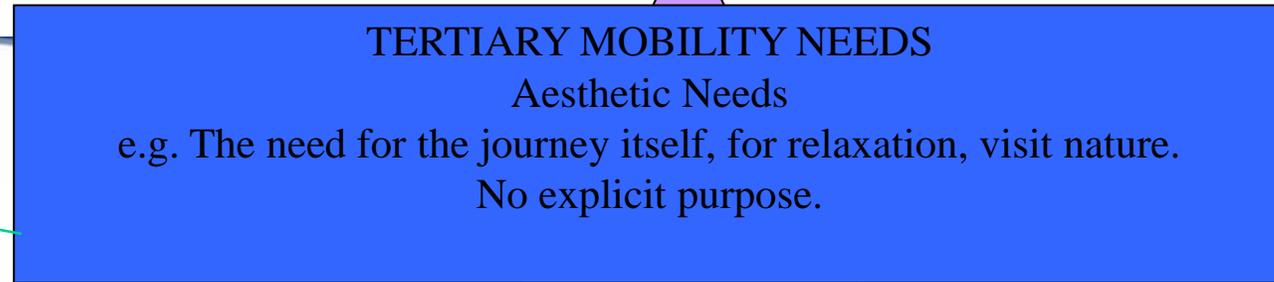
"I have family in Australia I don't get to see yet I feel quite close as we Skype quite a bit. It's so lovely to see their little ones, my great-nieces and nephews" (female, aged 80, community transport user)
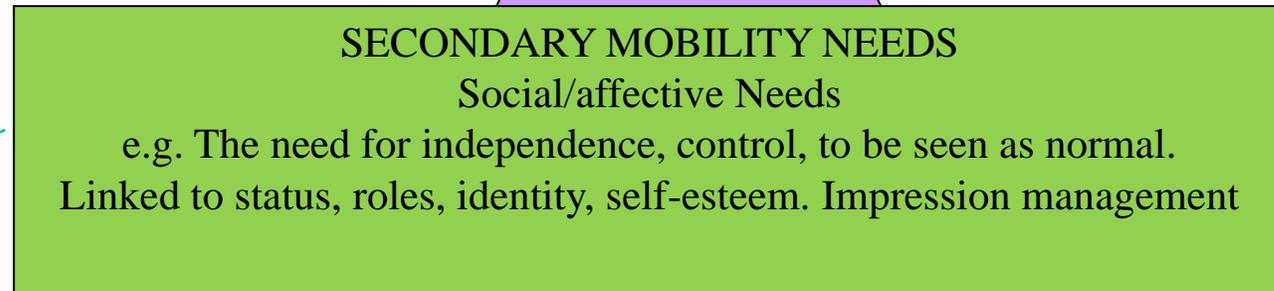
"Yeah I get stuff delivered now. It's so much easier and they'll bring it right up to your kitchen door and even help with some of the heavy things you know' (female, aged 77, bus user)

TERTIARY MOBILITY NEEDS
Aesthetic Needs
e.g. The need for the journey itself, for relaxation, visit nature.
No explicit purpose.

SECONDARY MOBILITY NEEDS
Social/affective Needs
e.g. The need for independence, control, to be seen as normal.
Linked to status, roles, identity, self-esteem. Impression management

PRIMARY MOBILITY NEEDS
Practical/utilitarian Needs
e.g. get from A to B as safely, reliably, cheaply and comfortably as possible.

Musselwhite, C.B.A. (2019). Older people's mobility, new transport technologies and user-centred innovation. In B. Müller and G. Meyer (eds.) Towards user-centric transport in Europe – Challenges, solutions and collaborations. Lecture Notes Series, Switzerland: Springer. Pp 87-103

Innovation 2: Substitute literal mobility

User innovation
Positive

- **Parcels for the street**

Thanked with gifts, people visiting and chatting, helping to stay connected.

- **Grey Uber**

"I'm driving people in the local community around, people I know, but I know sometimes, because when I get there they say, that I could've taken a few others who've got a taxi there themselves. So something that joins us all up. Something like Uber for oldies? Grey Uber would be the way forwards?" (male, aged 76, car driver)

- **Online shopping**

"Since they <name> can't drive anymore, I offered to do them a shop, then when I didn't drive I do their shop online. They're very grateful and I find it quite purposeful, feeling quite useful" (female, bus user, aged 79)

TERTIARY MOBILITY NEEDS
Aesthetic Needs
e.g. The need for the journey itself, for relaxation, visit nature.
No explicit purpose.

SECONDARY MOBILITY NEEDS
Social/affective Needs
e.g. The need for independence, control, to be seen as normal.
Linked to status, roles, identity, self-esteem. Impression management

PRIMARY MOBILITY NEEDS
Practical/utilitarian Needs
e.g. get from A to B as safely, reliably, cheaply and comfortably as possible.

Musselwhite, C.B.A. (2019). Older people's mobility, new transport technologies and user-centred innovation. In B. Müller and G. Meyer (eds.) Towards user-centric transport in Europe – Challenges, solutions and collaborations. Lecture Notes Series, Switzerland: Springer. Pp 87-103

- **Change the vehicle**

Towards driverless or automated vehicles:

- **Informative systems**
  - Much preferred
  - Head-up displays
  - Prioritise and manage displays

- **Advisory systems**
  - Warning messages liked if understood
  - Somewhat liked

- **Take over systems**
  - Potentially most useful but least liked
  - Improved when used!

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS

0	1	2	3	4	5
No Automation	Driver Assistance	Partial Automation	Conditional Automation	High Automation	Full Automation
Zero autonomy; the driver performs all driving tasks.	Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.	Vehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times.	Driver is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice.	The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle.	The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle.

- Reality?
  - Totally autonomous? Older people take longer to re-take control of vehicle, underload-overload issues greater etc.

Innovation 3: Vehicle innovation

Automated vehicles;
Positive

- **Connect with hobbies**

"Well, I'd go back and see the Swans <Swansea football team> again if I had a car driving for me. I wouldn't have given my season ticket up. That was a major factor, just couldn't get there by bus and too far to walk with my knees" (male, aged 80, bus user)

- **Stops the burden**

"Well if it came down to a choice were I couldn't drive anymore then yeah sure I'd rather have an automated vehicle driving me than taking a bus or burdening people for lifts" (male, aged 80, car driver)

- **Can go when and where you want**

"well it would mean that at least I'm not beholden to a bus timetable. I'll still pick and choose when and where I go" (female, car driver, aged 72)

- **Sharing**

"again it has the advantage over the bus of being your own vehicle, your own private space" (female, car driver, aged 78)

- **Connects to family and friends**

"well it would be so easy to go and see my daughter and her family. I don't like driving so far to see them, but this would just be so easy. I'm all for it" (female, aged 75, lifts from family and friends)
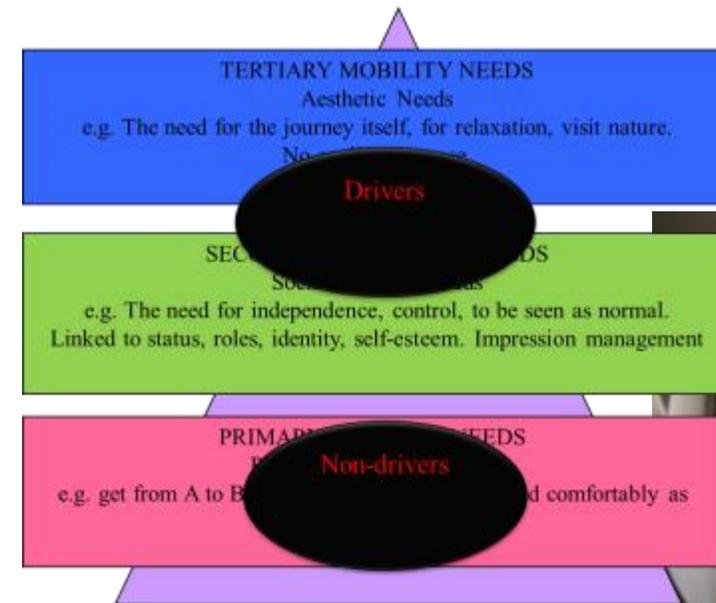
Concerns

- **Trust**

"I worry about them stopping for pedestrians. I hear they can but I wouldn't trust it, I wouldn't try it out!" (female, aged 75 walker)
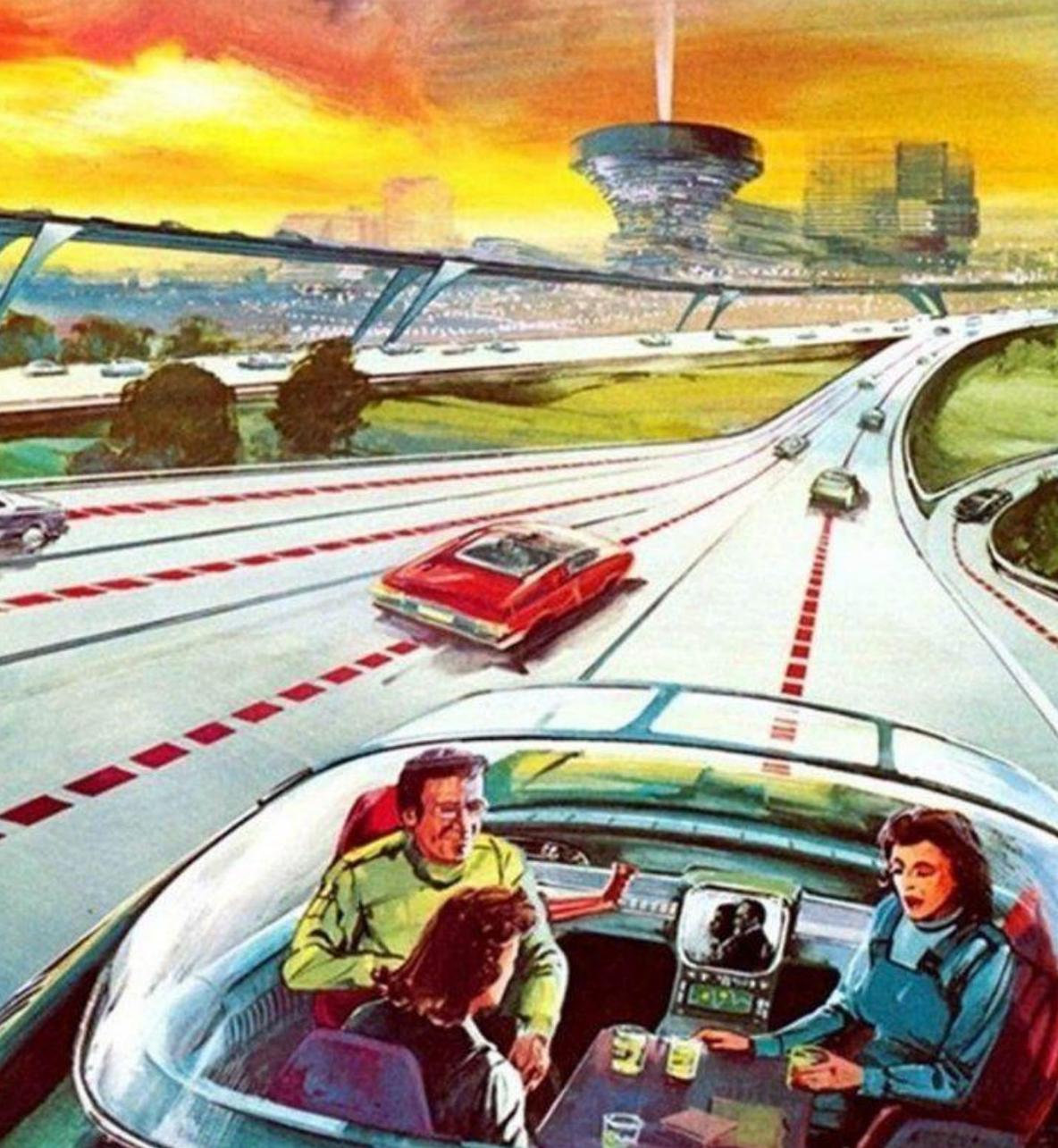
- **Sharing**

"I wouldn't want driverless cars you have to share. I'd want my own to have to look after. And have my own space" (female, aged 74, car driver)

College of Human and Health Sciences
Coleg y Gwyddorau Dynol ac Iechyd
Centre for Innovative Ageing

Swansea University
Prifysgol Abertawe

Conclusion

Human centred issues arise with new technologies
- Trust of technology
- Sharing of services
- Control over technology
- Want people to interact with not machines
- Deficit approach – something that needs plugging, rather than user- led innovation.

Like for like, rather than substitution. Our need for mobility must be maintained and can't be stemmed or changed – is this true? Is it what we want?

Not enough thought on psychological or aesthetic needs of people

Over emphasis on sharing when it isn't the norm.

Need much more involvement of older people in design of technology and how it fits to their lives

Their own solutions are lo-tech and fit in with daily practices.

Musselwhite, C.B.A. (2019). Older people's mobility, new transport technologies and user-centred innovation. In B. Müller and G. Meyer (eds.) Towards user-centric transport in Europe – Challenges, solutions and collaborations. Lecture Notes Series, Switzerland: Springer. Pp 87-103 Read blog at https://transportmobilityanhttps://transportmobilityandageing.wordpress.com/dageing.wordpress.com/ and www.drcharliemuss.com