

Cycling and Safety: change must take root in people's minds

(Written version of presentation to [Cycling Safety as an Obstacle: fears, myths and social learning](#), International Conference: Bike and City, Madrid, 9-10 March.2015.)

Abstract

This essay is a response to an invitation to provide an overview of the current state of cycling in Britain, and more specifically London, for a conference in Madrid – a city, like London, striving to promote more cycling. The essay focuses on the importance of both the volume of motorised traffic and perceptions of safety as determinants, over time, of the volume of cycling. It notes the dramatic decline (over 95%) since 1950 in the road accident fatality rate in Britain as cyclists, pedestrians and motorists competed for the right to the use of limited road space – and how in selected areas of London cyclists are in the process of regaining their right to the road.

Key words

Risk compensation, driverless cars, risk perception

I must begin by saying *muchas gracias* to the organizers of this conference for inviting me to participate. I was much encouraged by the enthusiasm I encountered on the part of those promoting cycling in Madrid, and in Spain more widely. But the way ahead in both our countries is challenging.

In Madrid there has been a small increase in cycling which rose from 0.3% in 2008 to 0.6% in 2009. The city aims for a 500% increase (!) to 3% for 2016.¹ London would appear to be only slightly ahead with 3% getting to work by bicycle in 2011 (ranging from 9% in an Inner London borough to less than 1% in some outer boroughs.² As in Madrid it is now a policy objective that cycling should increase.³

Road safety in Great Britain⁴ - the background

Before looking at the safety challenges facing cycling in Britain it will be helpful to look at the wider road safety picture. Figure 1 appears to present a picture of impressive progress – a 96% drop in fatalities *per billion motor vehicle kilometres* between 1950 and 2012. Over the

¹ <http://sootfreecities.eu/city/madrid> - it is not stated whether these percentages refer to numbers of trips or kilometres travelled, but by either measure cycling makes a very small contribution to travel in Madrid.

² [Walking and Cycling Statistics \(www.gov.uk/government/organisations/departments-for-transport/series/walking-and-cycling-statistics\)](http://www.gov.uk/government/organisations/departments-for-transport/series/walking-and-cycling-statistics)

³ To 5% of all daily journeys by 2025 - http://en.wikipedia.org/wiki/Cycling_in_London#CITEREFThe_Guardian2008

⁴ Because of the way the statistics are collected we will focus on Great Britain rather than the UK (which includes Northern Ireland).

whole of this period fatalities per kilometre decreased by an average 5.3% per year⁵ – a sturdy foundation for the myth that Britain’s roads have been getting steadily safer.

Figure 1

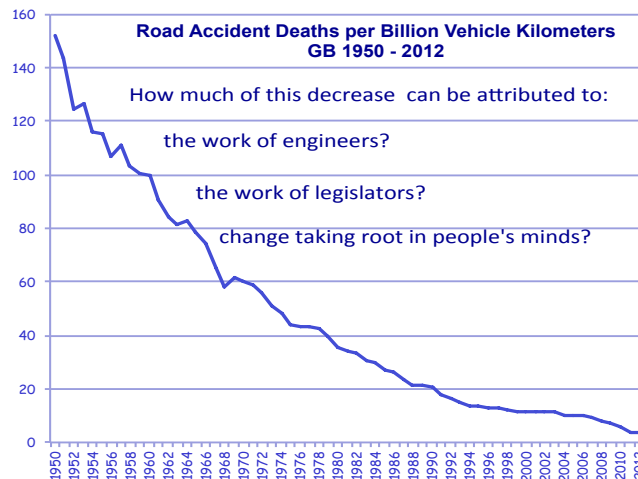


Figure 2 presents an even wider picture, and one that provokes challenging questions about how the decrease in Figure 1 has been achieved. It shows the correlation between the national road accident fatality rate per 100,000 vehicles for 134 countries plotted against the countries’ scores on the United Nations Inequality-Adjusted Human Development Index⁶. Spain, circled red, scores slightly below the UK on both measures. The Central African Republic, which scores highest on both measures, has a death rate per vehicle over 3000 times higher than Norway, which scores lowest on both measures. All the countries at the lower end of the trend have, like the UK, experienced large declines since 1950. There are some large outliers, so it clearly does not explain everything.

Figure 2

⁵ Adams, J. “Risk: mathematical **and** otherwise” The *Mathematics Enthusiast*, vol.12, no. 1&2, 2015

⁶ Created by Mahbub-ul-Haq and Nobel Laureate Amartya Sen, the Inequality-Adjusted Human Development index is a composite of average longevity, education and income, adjusted for inequality - http://en.wikipedia.org/wiki/Human_Development_Index, see also Figure 7 in Adams, J. “Risk: mathematical **and** otherwise” The *Mathematics Enthusiast*, vol.12, no. 1&2, 2015

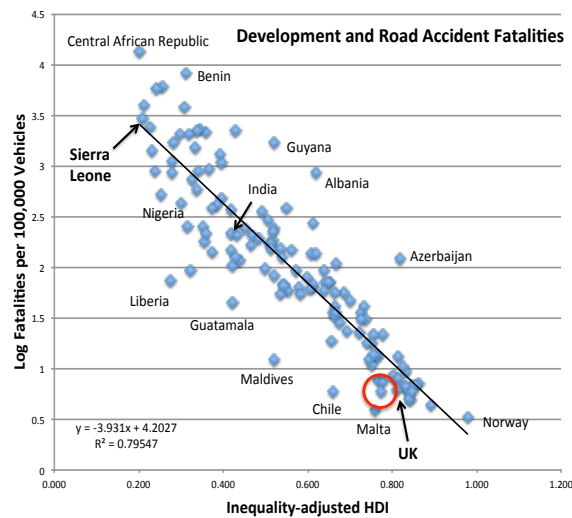


Figure 3 provides a reminder of the importance of the metric chosen to describe road safety progress, or lack of it, over time. It shows that **total** road accident fatalities per year in Britain, far from decreasing at a steady rate over this period, increased rapidly until the early 1970s. This is because traffic was increasing much faster than 5.3% per year in the 1950s and 60s. While steady progress was being made in fatalities per kilometre in this period, the total number of people killed in road accidents increased by more than 60%. And while the fatality rate per vehicle in the Central African Republic is more than 3000 times that of Norway, because it has few cars its fatality rate per 100,000 people is merely 5 times that of Norway.

Figure 3



By either measure, road accident fatality rates in Britain are now far lower than they were in 1950. However, Figure 1 poses three questions about the possible causes of this decline – who or what deserves the credit for the decline?

1) The work of engineers? Over this time, engineers have been busy making cars more controllable, with better brakes, suspensions and steering, and also more crashworthy. The highway engineers have also been busy lengthening sight lines, removing roadside obstacles such as trees, installing pedestrian barriers and improving signage but, principally, with projects that segregate motorised traffic from pedestrians and cyclists.

2) The work of legislators? The legislators have also been busy passing seat belt laws, motor cycle helmet laws, speed limit laws, drink drive laws and laws forbidding the use of mobile phones while driving.

3) Change taking root in people's minds? In this essay I will be backing the contention embedded in this third question – change has to take root in people's minds. This question was provoked by my new favourite philosopher, Michael Sandel of Harvard, who has observed that "Change has to take root in people's minds before it can be legislated."⁷ Almost all of the developing countries toward the top end of the trend in Figure 2 have, on their statute books, laws banning speeding, drinking and driving and the use of mobile phones while driving; and almost all have laws requiring the use of seat belts and helmets. None of them have car-manufacturing industries; they are achieving their extraordinary kill-rates per vehicle with modern imported vehicles with 100 years of safety technology built into them. And the fact that they have inferior roads is unlikely to explain the enormous difference between countries at the top and countries at the bottom; potholes, like speed bumps, slow traffic and reduce the severity of the accidents that do occur. So what else is going on?

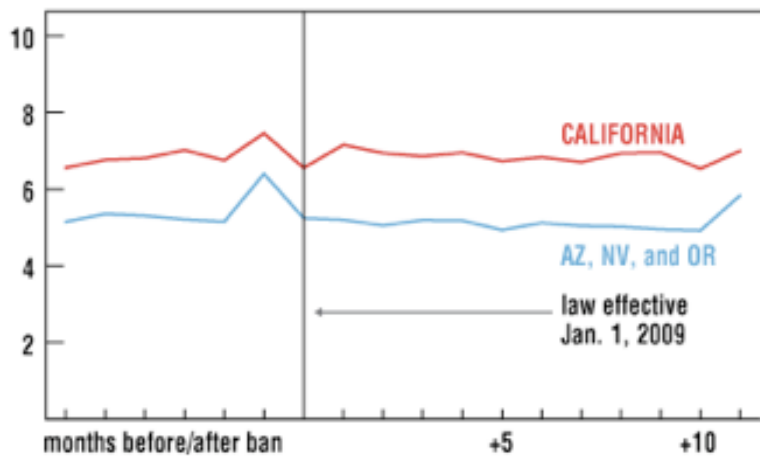
Figure 4 provides an example from the United States of a phenomenon to which the Sandel dictum might be applied. In 2010 the Insurance institute for Highway Safety published the results of a study that confounded their expectations. Four states, California, Louisiana, Minnesota and Washington, passed laws banning texting while driving – laws passed with the intention of reducing "distracted driving". These laws constituted natural experiments. Each state had on its borders other states that had not passed such laws, and these states served as controls by which the effects of the banning laws were measured. The result was: "texting bans don't reduce crashes; effects are slight crash increases." Figure 4 displays the result for California, measured against the control states of Arizona, Nevada and Oregon. This unexpected result was described by the authors of the study as a "perverse twist".

Figure 4⁸

⁷ <http://www.theguardian.com/lifeandstyle/2013/apr/27/michael-sandel-this-much-i-know>

⁸ <http://www.iihs.org/news/rss/pr092810.html>

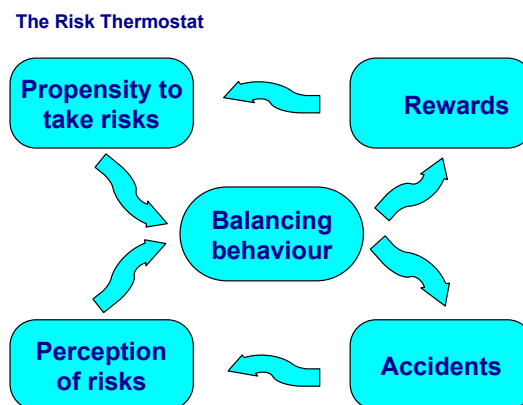
California — Collision claims per 100 insured vehicle years, by month before and after texting law for all drivers, compared with Arizona, Nevada, and Oregon



Apparently the change in the law was not accompanied by a change that had taken root in people's minds; or rather not the *desired* change. A law that was intended to decrease "distracted driving" appears to have increased it. The report's somewhat tentative conclusion: "clearly drivers did respond to the bans ... what they might have been doing was moving their phones down and out of sight when they texted, in recognition that what they were doing was illegal. This could exacerbate the risk of texting by taking drivers' eyes further from the road and for a longer time."

The Sandel dictum and the "perverse twist" illustrated by Figure 4 are consistent with the *Risk Compensation Hypothesis* set out in Figure 5.

Figure 5.⁹



The model postulates that

- everyone has a propensity to take risks – the setting of the thermostat;
- this propensity varies from one individual to another;
- this propensity is influenced by the potential rewards of risk taking;

⁹ Much more can be found on this subject in my books, *Risk and Freedom* (1985) and *Risk* (1995) and on my website – <http://www.john-adams.co.uk/>

- perceptions of risk are influenced by experience of accident losses – one's own and others';
- individual risk-taking decisions represent a balancing act in which perceptions of risk are weighed against propensity to take risks; and
- accident losses are, by definition, a consequence of taking risks – to take a risk is to do something that carries with it a probability of an adverse outcome; the more risks an individual takes, the greater, on average, will be both the rewards and the losses he or she incurs.

Figure 2 suggests that, as with the work of legislators, change must take place in people's minds before the safety efforts of engineers can produce their intended benefits. As noted above, the countries toward the top of the trend line are achieving their impressively high road accident death rates with imported cars with 100 years of safety technology built in to them.

Now let's look at cycling (and walking)

While total road accident fatalities were increasing rapidly in Britain up to the early 1970s, cyclist fatalities were dropping steeply – Figure 6. And while total road accident deaths *per kilometre travelled* had been dropping in Britain, cyclist fatalities per kilometre cycled rose steeply until the early 1970s. This can be explained by the precipitous – 87% - decline in cycling during this period shown in Figure 7. Figure 7 also shows that the peaking in fatalities per kilometre cycled coincided with the trough in numbers of kilometres cycled. I would be fascinated to know if comparable Spanish data exist.

Figure 6

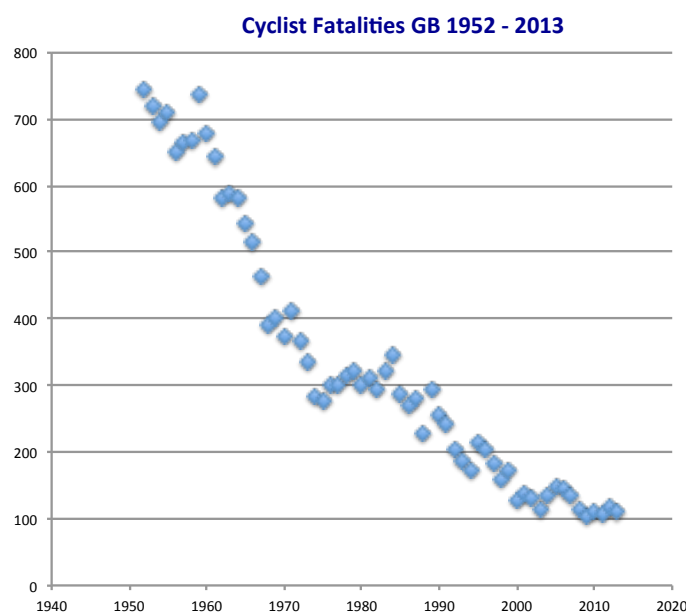


Figure 7

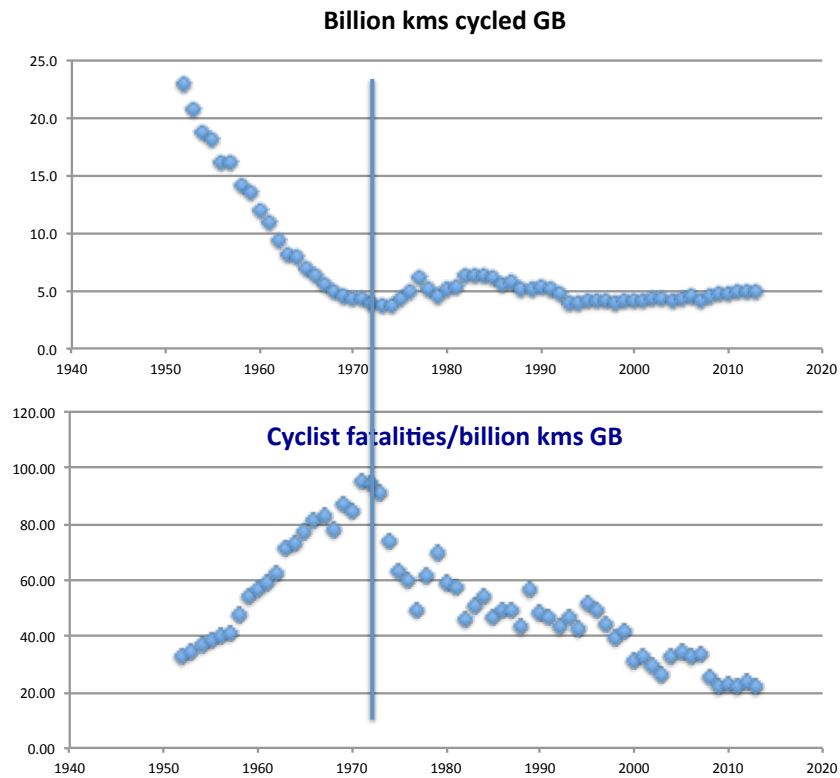
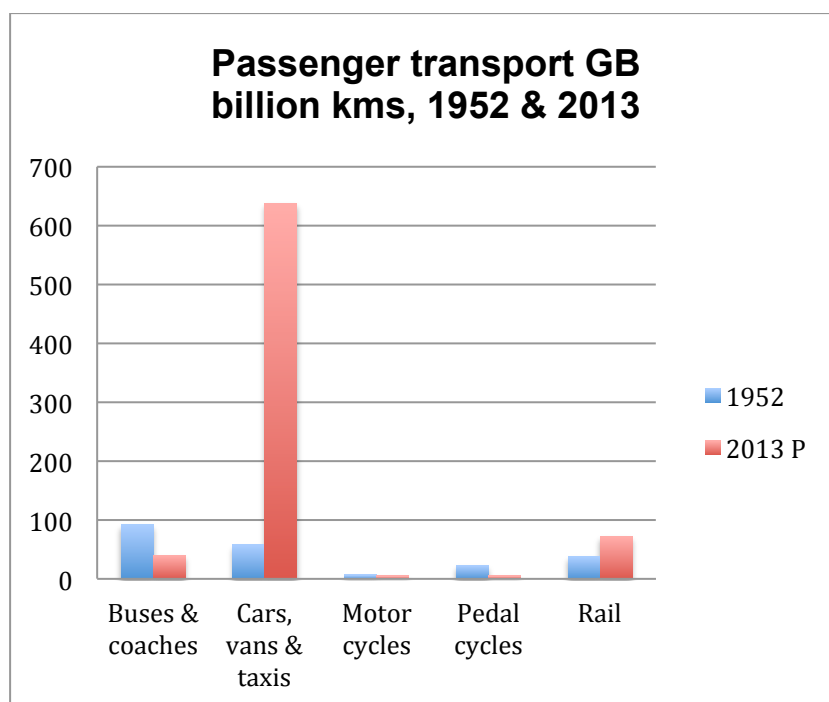


Figure 8 provides another perspective on this trend by highlighting the enormous change in the modes of transport used by Britons over this period.

Figure 8¹⁰



¹⁰ *Transport Statistics Great Britain 2014*, Table tsqb0101

It shows that while bus and coach traffic had more than halved since 1952, and cycling had fallen by almost 80%, car and van traffic had increased 11 fold. And although passenger traffic by rail had increased, it had almost halved as a percentage of the total. Over this period of enormous increase in motorised traffic the length of Britain's roads increased by less than a third. And most of the new roads (76%) were minor roads built to accommodate the ex-urban sprawl generated by new car owners looking for road space on which to drive and places in which to park.

Cyclists were forbidden on the new roads labelled "motorways", and strongly discouraged on new dual-lane A roads. The nature of this discouragement can be inferred from the official guidance offered in the Highway Code to cyclists using them¹¹:

- "If you are turning right, check the traffic to ensure it is safe, then signal and move to the centre of the road. Wait until there is a safe gap in the oncoming traffic and give a final look before completing the turn. It may be safer to wait on the left until there is a safe gap or to dismount and push your cycle across the road", and
- "Remember that traffic on most dual carriageways moves quickly. When crossing wait for a safe gap and cross each carriageway in turn. Take extra care when crossing slip roads."

And at roundabouts

- "You may feel safer walking your cycle round on the pavement or verge. If you decide to ride round keeping to the left-hand lane you should be aware that drivers may not easily see you. Take extra care when cycling across exits. You may need to signal right to show you are not leaving the roundabout -watch out for vehicles crossing your path to leave or join the roundabout." And
- "Give plenty of room to long vehicles on the roundabout as they need more space to manoeuvre. Do not ride in the space they need to get round the roundabout. It may be safer to wait until they have cleared the roundabout."

In brief, the official advice to cyclists was to defer to the needs and speeds of motor vehicles and the imperfect vision of their drivers. And, on occasion, in the interests of their own personal safety, consider foregoing their right to use the road and walk around the traffic instead.

But what about pedestrians? While reliable figures for walking in Britain for much of this period do not exist, it also almost certainly declined steeply, although the start of the decline in walking may have been delayed until the early 1970s. While cyclists were competing directly with cars for road space, most pedestrians still had sidewalks. A 1971 study of five primary schools in England revealed that 80% of seven and eight year old children still got to school unaccompanied by an adult. A follow-up study of the same five schools in 1990 revealed that this number had dropped to 9%.¹² And now, 25 years on, parents who permit such behaviour face threats of being reported to the social services for being irresponsible

¹¹ <https://www.gov.uk/rules-for-cyclists-59-to-82/overview-59-to-71>

¹² *One False Move ...* Hillman, Adams and Whitelegg, 1990 - http://www.john-adams.co.uk/wp-content/uploads/2013/06/OneFalseMove_Hillman_Adams.pdf

parents.¹³ Figure 10 from a Ministry of Transport campaign in 1982 conveys the flavour of official advice being dispensed at the time.

At the start of this essay I referred to the “myth” that Britain’s roads were getting steadily safer over time. The decline in pedestrian fatalities shown in Figure 9 almost certainly mirrors a steep decline in pedestrian exposure to risk. The poster in Figure 10 suggests that roads were perceived as getting so dangerous that children could no longer be allowed out unaccompanied.

Figure 9

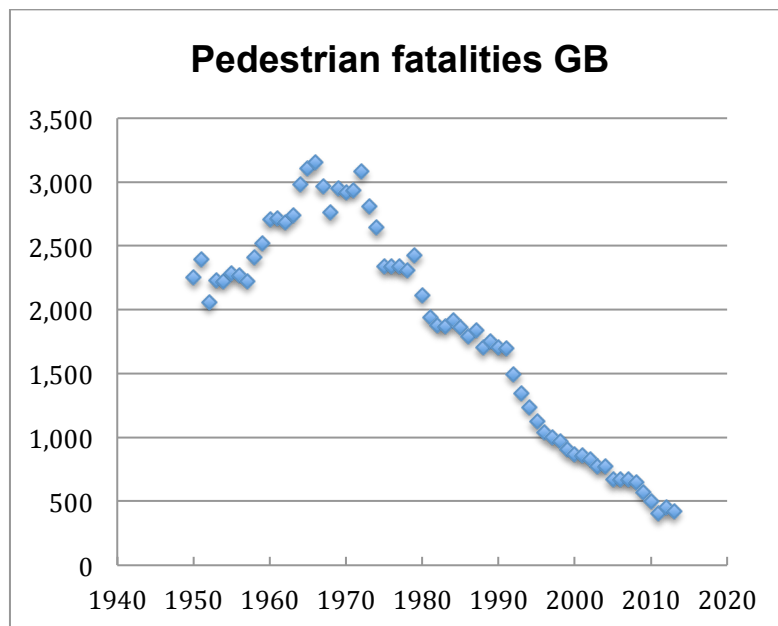
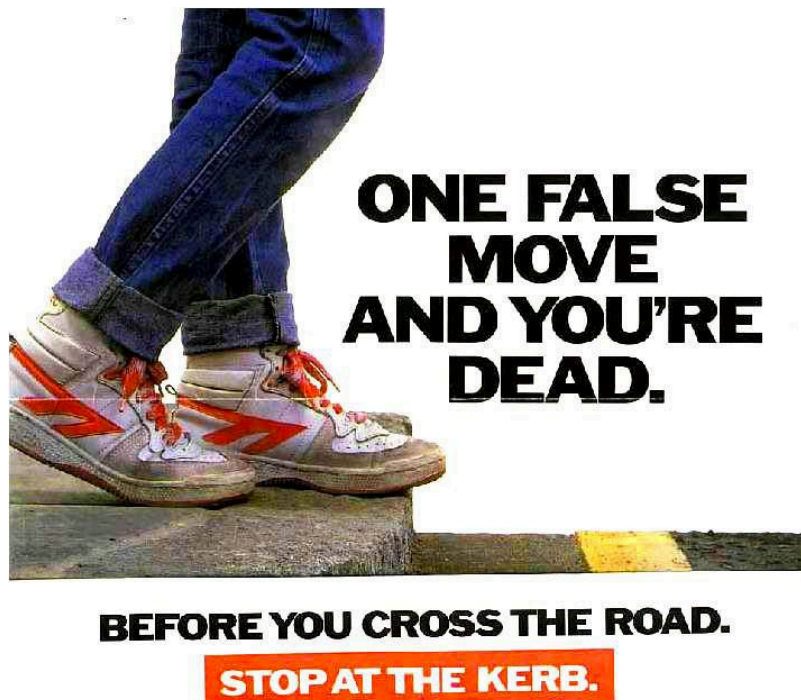


Figure 10¹⁴

¹³ <http://www.dailymail.co.uk/news/article-1291970/Couple-threatened-social-services-children-ride-bikes-school.html>

¹⁴ From Shared Space – The Next Step in Urban Development?
<http://www.architecturenorway.no/stories/people-stories/hamiltonbaillie-11/>



Much of the remarkable 96% reduction in the number of fatalities per motor vehicle kilometre on Britain's roads since 1952, displayed in Figure 1, has been attributed in this essay to the large reduction in the numbers of vulnerable road users (cyclists and pedestrians) who were crowded off the roads by the enormous increase in numbers of cars. While some cyclists and pedestrians transferred willingly to cars, many others, retreated or, in the case of children, who were no longer permitted unsupervised on the streets, were withdrawn, out of fear. But Figure 2 (where I plot development against road accident fatalities) suggests that more careful, less aggressive driving also deserves a share of the credit. Anyone who has experienced traffic in countries at either end of the trend described in Figure 2 cannot fail to have observed the dramatic difference in the attitudes of road users, both in vehicles and on foot or bicycle, to the risks of being on a road. As motorisation increases, change does take place in people's minds.

What might the future hold?

In Britain at the time of writing, while cycling is still retreating in most of the country, it is experiencing a revival in a few urban centres; and the centre of London in the morning rush hour has become a cycling hotspot, with 24% of vehicles on the road being bicycles. The mayor of London has published his "Vision"¹⁵ - a plan to transform London into a larger version of Amsterdam in which cycling will become "normal, a part of everyday life". He has designated three London boroughs "Mini-Hollands" in the hope that his programme "will help make them as cycle-friendly as their Dutch equivalents."

His Vision contains a few kilometres of spacious Dutch style "cycle superhighways" and modest plans for traffic calming measures in the Mini-Hollands, but on most streets cyclists will still be left to contest their right to the road with motor vehicles or to struggle on a few

¹⁵ <https://www.tfl.gov.uk/cdn/static/cms/documents/gla-mayors-cycle-vision-2013.pdf>

more kilometres of seriously inadequate cycle lanes. At present cycling in central London's morning rush hour is an experience largely confined to aggressive, helmeted young urban warriors, shown in Figure 11 bravely competing for road space. Figures 12 and 13 illustrate the distance yet to be travelled before cycling in London will feel like an Amsterdam experience.

Figure 11¹⁶. Morning rush hour London



Cycling to work in Amsterdam is an altogether more relaxed experience, not requiring special head protection. And cycling to and from school (Figure 13), something London children are not permitted to do, is a normal activity in the Netherlands.

Figure 12. Morning rush hour Amsterdam¹⁷

¹⁶ <http://us.123rf.com/450wm/micchaelpuche/micchaelpuche1408/micchaelpuche140800196/30847127-london--may-6th-unidentified-people-commute-to-work-on-may-the-6th-2014-in-london-england-uk-the-lon.jpg>

¹⁷ <https://bicycledutch.files.wordpress.com/2013/03/amsterdam.jpg?w=547&h=311>



Figure 13. Home time at a Dutch school¹⁸



In London, the mayor of London's Vision of safe Dutch streets is likely to face competition from a new quarter – in the form of a central government vision of a country in which everyone moves about in driverless cars. Central government is backing its vision with taxpayers' money. In its most recent budget it earmarked £100 million, to be matched by an industry investment of the same amount, "to ensure the UK is at the forefront of the testing and development of the technologies that will ultimately realise the goal of driverless vehicles."¹⁹

¹⁸

[https://www.google.co.uk/search?q=home+time+at+a+dutch+school&espv=2&biw=1467&bih=1267&source=lnms&tbm=isch&sa=X&ei=RBBnVYvBD-XO7gbZm4L4Cg&ved=0CAYQ_AUoAQ#imgrc=V0Kwf1oP2WZIVM%253A%](https://www.google.co.uk/search?q=home+time+at+a+dutch+school&espv=2&biw=1467&bih=1267&source=lnms&tbm=isch&sa=X&ei=RBBnVYvBD-XO7gbZm4L4Cg&ved=0CAYQ_AUoAQ#imgrc=V0Kwf1oP2WZIVM%253A%253A)

¹⁹

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401562/pathway-driverless-cars-summary.pdf

Progress has been impressive. There are now, available online, numerous video demonstrations of the superior safety of driverless cars; they do not suffer from lapses of concentration and they can be programmed, in situations of conflict, to defer to any pedestrians or cyclists that they might encounter. Here is a description of what has already been achieved, by Astro Teller, the man in charge of Google's driverless car project:

"A few months ago our self-driving car [with a safety driver in the car] encountered an unusual sight in the middle of a suburban side street. It was a woman in an electric wheelchair wielding a broom and working to shoo a duck out of the middle of the road. ... the car did the right thing. It came autonomously to a stop, waited until the woman had shooed the duck off the road and left the street herself and then the car moved down the street again."²⁰

And here is the vision of Sergey Brin, co-founder of Google, of what might be achieved once this programmed deference of driverless cars has been perfected: "... if cars could drive themselves, there would be no need for most people to own them. A fleet of vehicles could operate as a personalized public-transportation system, picking people up and dropping them off independently, waiting at parking lots between calls. ... Streets would clear, highways shrink, parking lots turn to parkland."²¹

And here is Elon Musk, co-founder of PayPal and Space X and chairman of Tesla Motors highlighting the safety of driverless cars: "People may outlaw driving cars because it's too dangerous. You can't have a person driving a two-tonne death machine."²² And Sebastian Thrun, also involved in the development of the Google car, making the same point after presenting impressive video evidence of the car safely negotiating dense urban traffic in California: "I really look forward to a time when generations after will say how ridiculous it was that humans were driving cars".²³ The mayor's vision and that of the developers of driverless cars would appear, at first glance, to be mutually supportive.

In *The Pathway to Driverless Cars* the UK Government concludes that during the development phases, the existing legal and regulatory framework will not be a barrier to the testing of automated vehicles on public roads "*providing a test driver is present and takes responsibility for the safe operation of the vehicle.*" But the ultimate goal is the elimination of the test driver; the development of cars that will drive themselves.

So how would Google's "deferential" vision work in jostling central London where I live? Or in the crowded streets of Madrid? I have found no explorations of the question. How might other road users respond? Children, almost certainly, will have discovered a new game – bowling balls across the street to see how quickly cars stop. The rest of us – on foot or bicycle - will also become aware of our new power to annoy people in cars.

All of the descriptions and video demonstrations of progress so far that I have been able to

²⁰ <http://mashable.com/2015/03/19/tesla-google-driverless-car/>

²¹ <http://www.newyorker.com/magazine/2013/11/25/auto-correct>

²² <http://www.legalexaminer.com/automobile-accidents/driverless-cars-and-the-dangers-of-distracting-technology/>

²³ http://www.ted.com/talks/sebastian_thrun_google_s_driverless_car?language=en

find with the help of Google (itself the leading proponent of self-drive cars) demonstrate quite convincingly that, in a future in which all cars are self driven, interactions between cars could be controlled in a way that would make car travel safer and more efficient – on motorways or on any other roads from which pedestrians and cyclists are excluded.

But these descriptions and demonstrations also stress that in the case of interactions between cars and vulnerable road users (pedestrians and cyclists – plus cats and dogs) the cars will have to be programmed to behave deferentially. Moral reckoning to one side, anticipation of the public relations disaster that would follow the first killing of a child by a driverless car demands fail-safe programmed yielding to those on the street but not in cars.

This deference would clearly become obvious to pedestrians and cyclists, and the Risk Compensation Hypothesis discussed above predicts a behavioural response. Secure in the knowledge that they were now kings and queens of the road, their behaviour would surely change. Pedestrians would no longer cower at the roadside trying to judge whether gaps in the traffic could see them safely to the other side. They would be liberated to stride confidently into the road knowing that traffic would stop for them. And cyclists, not just children, could enjoy the freedom to cycle two or three abreast with friends holding up middle fingers to the cars honking behind. (Will they be programmed to honk?)

Consider the cyclists in Figure 11. Knowing that all the motor vehicles were programmed not to hit them, would they not claim much more of the road? The fail-safe programmed deference of which the proponents of driverless cars boast will, in crowded streets such as that pictured in Figure 11, result in the deferential paralysis of motorized traffic.

Might the dramatic decline in cycling since 1950, and in walking since the early 1970s, be reversed by the advent of deferential cars? After many decades of retreat before the advance of the car, might cyclists and pedestrians start to reclaim the road space that they have yielded? There is much talk about such cars creating the need for a revision of the rules of the road; Britain's Highway Code referred to above would need to be re-written. But How?

Either deference will prevail, leading to the deferential paralysis referred to above. Or roads and laws will need to be changed to produce motorway style segregation of motor vehicles and vulnerable road users. Or cars will have to be programmed to insist on their legal right of way at the cost of death and injury. Cyclists, careless distracted pedestrians on mobile phones, heedless children, cats and dogs, broom-wielding women in wheel chairs, and many others would have to be programmed as legitimate victims to be sacrificed in the name of efficient traffic management.

The developers and promoters of driverless technology are amongst the world's most profitable enterprises. They are investing many billions of dollars in the project and are promoting it enthusiastically. They have a clear interest in the rules of the road allowing space for their cars, and a proven ability to mold public opinion and influence government policy.

Change will take root in people's minds. What will this change look like?