Usain Bolt aside, human beings are not built for speed. Our light, fragile frames can withstand most impacts with static objects at our running pace, but when our ancestors started traveling faster on horseback, some 5,500 years ago, our injury risk increased. Eventually the motor vehicle multiplied significantly the kinetic energies human bodies would have to absorb in road transport collisions. No wonder hundreds of thousands of vulnerable road users (VRUs) are killed or seriously injured every year.

In fact, the World Health Organization (WHO) reports that 22% of all road traffic deaths per annum are pedestrians. That’s 270,000 people killed each year, usually because they’ve been hit by a vehicle of far greater mass that’s been traveling far faster, too. Considering that the early motor cars once had to be preceded by a VRU on foot carrying a red warning flag, clearly the pendulum of danger has swung too far the wrong way. The UN’s Decade of Action for Road Safety is evidently a nod to that fact, hence why its global plan puts pedestrians and cyclists first.

Starting points

The universal dimensions of time and space are crucial here. When all road users have more time and space to avoid each other, they have a better chance. The right technology and infrastructure can do this, but in the poorest countries, such as Liberia where 66% of road death victims are pedestrians, technological solutions can be too expensive – not just to install, but also to maintain. So the first step is to design roads with VRUs in mind. “The needs of pedestrians have been neglected for decades, often in favor of motorized transport,” believes Dr Etienne Krug, director for violence and injury prevention and disability at the WHO. “We need to rethink the way we organize our transport systems to make walking safe and save pedestrian lives.”
Vulnerable Road Users

| Down to the planning? |

Véronique Feypell de la Beaumelle from the International Transport Forum, the OECD’s intergovernmental strategic think-tank, says that designing for pedestrians needs to be a full component of urban planning. It follows the OECD’s mission to promote policies to improve the economic and social well-being of people around the world and, naturally, includes road safety.

“There’s often very little consideration for pedestrian safety when new roads are built,” says Feypell de la Beaumelle. The problem is particularly acute in low-income and middle-income countries, 84% of roads where pedestrians are present carry traffic at 25mph faster yet there are no footpaths.

“Pedestrian footpaths can reduce the likelihood that people will be struck by vehicles while walking by as much as 40-60%,” says John Dawson, iRAP chairman.

Installing footpaths with curbs isn’t cost-free, but iRAP reckons it’s justified because the high costs of crashes are then avoided. Adding them to 330 miles of road in Chile is expected to prevent 6,100 KSI collisions over 20 years, saving 28 times more than the cost of improvement. Installing 310 pedestrian crossings in Costa Rica should prevent 3,100 KSIs, recouping the cost 19-fold. Footpaths and crossings in Moldovan villages cut KSI risks by 40%.

The role of technology

Before improving infrastructure, technology can help. In Cape Town, video surveillance is used to reveal which permanent measures are likely to increase pedestrian safety. Similar studies of collision black spots in Mexico City have led to many design improvements, including shorter crossing distances, medians and island refuges and – as used already in many high-income countries – countdown signals that permit VRUs to judge whether they have adequate time to cross before traffic flows again.

So the WHO has a shopping list of road features to increase VRU safety, with footpaths topping the bill. According to surveys from the International Road Assessment Programme (iRAP), in low- and middle-income countries, 84% of roads where pedestrians are present carry traffic at 25mph faster yet there are no footpaths. “Pedestrian footpaths can reduce the likelihood that people will be struck by vehicles while walking by as much as 40-60%,” says John Dawson, iRAP chairman.

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Dr Etienne Krug, director, department of violence and injury prevention and disability, WHO

Robertson of Port Ellen, chairman of the Commission for Global Road Safety. A ‘quick fix’ being rolled out across the UK is to reduce urban speed limits from 30mph to 20mph, with signage key to advising drivers about the appropriate, safer speed – vehicle-activated signs even more so.

Lower speed limits in themselves aren’t necessarily effective – they need to be enforced. Speed cameras can do this extremely successfully and red light cameras discourage drivers from ignoring traffic signals. Street CCTV, installed originally for crime prevention, can be seconded by spotting illegal parking that increases risks for VRUs. Pedestrian-activated signaled crossings have become ubiquitous across western Europe because they stop the traffic safely. Those...
equipped with pedestrian-detectors allow traffic to continue flowing when people are no longer waiting to cross. Brighter street lighting increases the visibility of VRUs at night.

**Cooperative systems**

In-vehicle technology is evolving to cut collisions with VRUs, but the next possible step is to link pedestrians and cyclists into the ITS network by equipping them with sensors, transceivers and alarms. Researchers from Chalmers University, Sweden, suggest that cooperative active safety systems could alert VRUs to incoming threats and advise them how best to stay safe.

Although most conflict between pedestrians and motorized vehicles happens when each strays into what’s normally regarded as the other’s space – the roadsides or the roadways – cyclists usually have to travel in the road, among the traffic. So they are currently viewed as particularly vulnerable – although perhaps the statistics exaggerate their risks relative to pedestrians. For example, levels of cyclist KSI crashes in the Netherlands have been rising, which is in contrast with the overall trend of increasing road safety.

But according to Malcolm Wardlaw of the Transport and Health Study Group, the analysis is wrong because the KSI data includes off-road cycling incidents, such as trail riding, and all single-bicycle falls. Yet sidewalk falls among pedestrians are excluded from highways statistics. The actual risks are clearer when the figures are corrected, says Wardlaw: “In the Netherlands, one-third of serious injuries on the roads are cyclists, and one-third pedestrians. However, 18% of time spent traveling is by bike, as opposed to 12% walking. Therefore in the Netherlands, the average risks of walking are higher than for cycling,” he explains.

**Cycle path**

Nevertheless, there’s a lot to be done to make road cycling safer, as 2012 Tour de France winner Sir Bradley Wiggins and his then team coach Shane Sutton know – both cyclists were in collisions with vehicles on successive days, many miles apart. “In the low- and middle-income countries assessed, 85% of roads where bicyclists are present carry traffic at 25mph or more and have no bicycle facilities,” notes iRAP’s John
Dawson. Just as footways protect pedestrians, separated cycle paths can save lives. “Bicycle paths reduce the risk that bicyclists will be struck by fast-moving cars, trucks or buses, by physically separating travel lanes. Well-designed on-road bicycle lanes can reduce bicyclist crashes by 25-40%,” Dawson emphasizes.

This has been shown in high-income countries, where cycling is being promoted to improve health and the environment. A new study in Iowa, USA, shows that simply painting a cycle lane on the road surface is more protective than mere signage, particularly at intersections. Research from this year in New Zealand shows that a raised divider and small bollards are even more effective at keeping bikes and traffic apart.

Intersections with traffic signals have attracted technological solutions because the minority of cyclists who jump red lights are conspicuous. Smart cameras can spot cyclists undetected by induction loops and so trigger a green signal. The Intersector micro-radar does likewise in Pleasanton, California, and Bournemouth in the UK.

Wet weather makes waiting cyclists even more impatient so the signals at junctions in Groningen in the Netherlands automatically give them a green signal more often when it’s raining. Cyclists in Aalborg, Denmark, are paced to a junction by a sequence of LEDs embedded in the road so they arrive at the signal as it turns green.

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Lord Robertson of Port Ellen, chairman, Commission for Global Road Safety

Intelligent agents

ITS company Geveko of Denmark uses its LED-Mark lights to increase the delineation between cycle lanes and the highway during the hours of darkness. The company has also developed road-embedded LEDs that sense approaching cyclists and then flash to alert drivers who are about to cross their paths.

Europe’s initiative to use technology for increasing cycle safety, SafeCycle, considered 121 proposals. They include on-bike lights that project cycle lane symbols onto the road fore and aft, rear-view cameras linked to a screen on the handlebar to display vehicles approaching from behind, braking lights and a bicycle airbag. Researchers at Rutgers University, New Jersey, have been prototyping bike-mounted vehicle detectors using both video and audio analysis in real time.

Bicycles have always attracted a constant flow of homespun innovations and it’s the same with cycling safety systems. Dutch engineers have linked smartphone satnav to a vibrating belt so cyclists are directed to their destinations without diverting their attention from traffic. Such solutions are relatively expensive and cyclists in low- and middle-income countries need more affordable protection, particularly as the number of motor vehicles increases. These countries need financial support to improve safety for all VRUs. “The response of bilateral donors, multilateral institutions, the private sector and large philanthropies has, with a few honorable exceptions, been miserably inadequate,” concludes Lord Robertson. So will 270,000 VRUs continue to pay the price with their lives every year? ☠