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**The COVID-19 pandemic** was propagated globally via travel and lockdown policies which have aimed to stop infections by curtailing travel and social interaction. The pandemic has been a major social, economic and environmental disruptor. Lockdown has provided a glimpse of cities with little traffic and people walking and cycling for their permitted exercise and to access food and health services. The disruption may lead to permanent changes. There may be more homeworking, more home deliveries, more use of the urban environment for exercise, more fear of travelling in crowded public transport which leads to changes in the way people travel. If our cities are less congested, vehicles may also move more quickly leading to a rise in speed and potential consequences for injury severity for collisions involving vulnerable road users.

In the UK, when the pandemic was at its peak in 2020, car travel was around a third of what it was pre-pandemic, heavy good vehicles were used half as much, while cycling saw a growth of around 300% (UK Government, 2021). The use of trains, underground and buses was only a fifth of what it was before the virus took hold.

These changes in the way we travel are likely to have significant impacts on road casualties. In the UK, there were an estimated 1580 road deaths in the year ending June 2020 which included three months of the national lockdown. This represented a statically significant decrease of 14% compared to the previous year. For all casualties, there was a significant reduction of 16% compared to the previous year. These reductions are in line with the reductions in vehicle traffic. Exploratory analysis by the UK Department for

Transport has shown that there were casualty reductions for vulnerable road users (with smaller reductions for pedal cyclists and larger reductions for pedestrians) and by severity (with smaller reductions for fatalities and seriously injured casualties than slightly injured casualties) (Department for Transport, 2021). Many EU countries have seen similar reductions in casualties related to reduced vehicle traffic.

Some of these changes in the way we travel may be permanent. Travel surveys conducted by the government in the UK during the peak of the pandemic showed that 39% of respondents reported to walk more and 38% reported to cycle more than before the outbreak. Of those that reported to walk or cycle more, 94% thought it is likely that they would continue to cycle and walk more once travel restrictions were removed (Department for Transport, 2020).

Mode shift because of the pandemic has implications for road safety. In cities like London, 80% of the casualties comprise vulnerable road users, i.e. those who walk, use a motorcycle or pedal cycle. If more people are walking and cycling, will we see more casualties? A shift to the car from public transport and to more vulnerable modes may occur because people are fearful of using public transport which may lead to more road casualties among pedestrians and cyclists. Less patronage of public transport could also have implications for road safety, especially if people choose to use a car instead. In London in the 1980s, cheap fares on public transport saw a reduction in road casualties as people gave up their cars to use public transport, so good public transport acts ostensibly as a road safety measure (Allsop & Robertson, 1994).

The economic impact of COVID-19 is likely to indirectly impact road safety. At the peak of the outbreak in the UK, Gross Domestic Product was 25% lower during the depth of the crisis in April 2020 than earlier in February. The economic impacts of COVID-19 will lead to rising levels of poverty and widening inequalities. The Black Report in 1980 identified the strong gradient between poverty and risk of being a road casualty for child pedestrians, research shows this relationship persists today. The reasons for this high risk relates to complex systemic factors in which the inherently hazardous environments play a strong role coupled with the fact that more people are dependent on walking because they cannot afford to run cars or use public transport. With increasing poverty levels caused by unemployment and the economic downturn, more people from the most deprived areas may be more exposed to risk as pedestrians.

The pandemic has also seen an increase in e-commerce and food or meal delivery. We know that people working in the highly time-pressurised delivery services often work in a context where there is little management of road risks. The time-pressurised and piece-rate nature of the work encourages speed limit violation and red-light running. For some, working in busy urban centres is mentally and physically fatiguing, and for those who get their work via phone apps, the work is highly distracting. Workers in the food delivery gig economy are often using the most vulnerable modes of transport such as scooters, mopeds, motorcycles and pedal bikes. Those on two wheels report being involved in a higher-than-average crash rate in which it is usually themselves that are being injured. The growth of e-commerce and meal delivery may well continue when restrictions relax, and people are still reticent about mingling with others in public spaces. In the UK, as in many other countries, it is extremely difficult to understand the casualties related to this way of working because police reporting of journey purpose is only completed in one in five cases. It is also hard to get to handle the denominator

- we just do not know how many people are working in the gig economy or as delivery workers per se. Interestingly, Transport for London have recently published fatal casualty figures which showed that during the lockdown period, there was a reduction in numbers for pedestrians and car drivers but the numbers were the same or had increased for powered two wheelers and pedal cyclists, respectively - could this be partly caused by people working in the delivery sector? A further concern about occupational road risk is that across the UK and the rest of Europe, there was the derogation of rules on driving time and truck driver rest periods to ensure continued movement of freight and supplies in addition to closure of rest areas. This could lead to driver fatigue and increased collisions involving heavy goods vehicles.

There has been a rapid response to accommodate changes in the way we travel due to the pandemic. On the 6th of May 2020, the Mayor of London announced a fast-track transformation of London's roads including new cycle lanes and routes and wider pavements to enable social distancing. This helped create new walking and cycling routes along major corridors. The "streetspace plan" was implemented to support an expected 10-fold increase in cycling and five-fold increase in walking post-COVID-19 lockdown. We are yet to know whether some of these changes will be permanent and they would represent a positive outcome unless cities revert to "business as usual" and let motorised vehicles once more dominate the road space.

Given the importance of walking, we should consider the safety of sidewalks or pavements and ensure that they are fit for purpose. For older people in particular, falls on the sidewalk are associated with higher levels of mortality than when crossing the road. Researchers (e.g. Methorst, Schepers, Christie, & de Geus, 2017) have argued for the definition of a pedestrian collision to include such events to bring attention to poor maintenance which poses hazards and to target resources at their remediation.

The pandemic has also seen local authority road safety staff being diverted to support the extra demands for other services to support communities during the crisis. Many local authorities will be looking to cut back public spending and in the last economic recession many road safety teams were decimated. With the many school closures, neither cycle nor pedestrian training has been delivered. We do not know the impact of this on safety. Such training cannot be delivered online; it needs to be practical, progressive and in situ. Road safety officers should be seen as a central public health asset supporting safe active travel and its benefits for the health and recovery of individuals, communities and wider society.

What does all this mean for road safety going forward? As economic activity increases, we are likely to see an increase in mobility and increase in traffic volumes. The pandemic has shown that we can take a proactive, generative approach to road safety - rather than just reactively responding to when injuries occur.

The pandemic has provided a natural experiment to see what happens when traffic levels are reduced, and measures are in place to create safe places for walking and cycling. When cities recover and if measures are taken away, we are likely to see an increase in vehicle flows. We need a more nuanced

Most importantly in the times of economic insecurity, we need to fight to safeguard funds for road safety, safe environments can deliver public health and reduce the burden on the health services. Safe environments are transformative - the pandemic has shown this.

understanding of the composition of traffic and the purposes for which people are travelling, especially for work. This will provide a denominator for understanding changes in risk. We need to know more about the impact of the gig economy and in particular the numbers of people using powered two wheelers. We need to monitor data on casualty numbers and disaggregate by the different user groups and understanding casualty rates in the most deprived areas. Speed needs to be monitored and enforcement needs to ensure that there is compliance. Also, we need to restore public confidence in taking public transport and ensure that it is as safe, efficient and cheap to make sure that the shift from buses to cars is reversed.

It is an opportunity to sustain habits of walking and cycling created during the pandemic to secure the public health benefits of more active citizens and cleaner air. But again, from a public health perspective, we need to know who are benefiting from these gains. Cycling uptake in the UK is low among people from deprived backgrounds where hazardous environments, fear of theft and lack of secure storage for bikes pose barriers to taking up cycling. People from deprived backgrounds have been disproportionately affected by the COVID-19, and while we need to increase the safety of all areas to aid recovery, we should do more in areas of deprivation.