

Influence of the Peltzman effect on the recurrent COVID-19 waves in Europe

Epidemiologists report there is no precise definition for what is or is not an epidemic wave. 'Waves' are a phenomenon of infections that can develop during a pandemic. A wave implies a rising number of sick patients, a characteristic peak of illness and then a dramatic or sustained decline of infections reaching a baseline.¹ Previous experiences with the Spanish influenza pandemic (1918) and seasonal influenza epidemics suggest further waves of COVID-19 are inevitable.² The UK has endured the first two waves of the COVID-19 pandemic with widespread socioeconomic consequences and mortality.³ The WHO regional office for Europe has recently reported that incidence, hospitalisations and deaths in Central Europe, the Balkans and the Baltic states are among the highest globally suggesting a third wave of COVID-19.⁴ The reason for this third wave in Europe and anticipated further waves in countries with vaccine roll-out including the UK could be due to the Peltzman effect.

The *Peltzman effect* is named after Sam Peltzman, professor of economics at the University of Chicago Booth School of Business. It describes the concept of 'Risk Compensation'.⁵ In this concept, it is argued that highway safety regulations were not reducing highway deaths. 'Risk compensation' is a theory that suggests that people typically adjust their behaviour in response to perceived levels of risk. It postulates that people become more careful where they sense greater risk and lesser careful if they feel more protected. Peltzman theorised that though the introduction of safety devices, like seat belts or air bags, reduced the ratio of fatalities to accidents, the rate of accidents was found to have risen enough to offset the decreased fatality rate. He proposed that though people felt safer driving with a seat belt, it probably led to a phenomenon of driving with less attentiveness or higher speed causing an increased risk of run-off-road crashes or similar accidents.

COVID-19 vaccination—The development and the roll-out of safe and efficient COVID-19 vaccines have been an effective weapon in the global fight against the COVID-19 pandemic triggered by the novel coronavirus SARS-CoV-2.⁶ Recent reports by Public Health England

suggest that both the Pfizer-BioNTech and Oxford-AstraZeneca vaccines effectively reduce COVID-19 infections among older people aged 70 years and over. In the older age groups (80 years and above), data suggest that a single dose of either vaccine is more than 80% effective at preventing hospitalisation and lowers the risk of serious illness with the Pfizer-BioNTech vaccine able to reduce mortality from COVID-19 by more than 80%.⁷ However, despite this global vaccination drive, the number of COVID-19 cases and mortality is rising again.

COVID-19 vaccination triggering Peltzman effect—An analysis of Peltzman effect reveals four main factors contributing to risk compensation, all of which appear to be present in the current COVID-19 pandemic. To initiate an increase in risky behaviour, a measurable benefit must be 'visible', a criterion that COVID-19 vaccines meet. This is supported by the decreasing number of infections in vaccinated populations.⁷ Risk compensation is more likely to occur if people have a 'motivation' to take on a risky behaviour and if it is within their 'control' to do so. With the COVID-19 pandemic these two factors seem to have manifested as 'pandemic fatigue' with decreasing adherence to risk reduction strategies of social distancing, face coverings and hand washing in the population. Such behaviours of risk compensation have raised concerns about threat to global public health efforts to control the pandemic.⁸ The final factor, the overall *effectiveness* of the intervention, in this case of the COVID-19 vaccine, is being increasingly recognised worldwide.⁹ This is highly desirable, increasing the likelihood of vaccine-acquired 'herd immunity'. However, for the Peltzman effect, this high efficacy is likely to reduce adherence to other safety precautions. Vaccination drives in most European countries started in late December 2020, after which the rise of cases was seen. Thus, people's complacency and a false sense of increased security after vaccination may have been the possible reasons for people to abandon protective and preventive behavioural strategies.

Other possible explanations—'Mutant strains' have been implicated for increased virulence of COVID-19. However, the rise in cases throughout Europe and even in Asian countries cannot be an effect of few mutant strains. Besides, vaccine developers have found most vaccines to be protective even against the new mutant strains. Fall in 'herd immunity' has also been argued to cause the rise in the spread.

However, vaccination will increase herd immunity and probably help curb severity and even spread of COVID-19. Unfortunately, the Peltzman effect may grow due to misplaced sense of security in herd immunity. One of the most disturbing features of the Peltzman phenomenon is that it may have a 'Bystander effect'. Simply observing someone else taking a precaution can potentially increase one's likelihood of taking a risk. Consequently, people who have not received a COVID-19 vaccine may forgo wearing face coverings and social distancing principles if they realise others are receiving the vaccine.

Strategies to counter the Peltzman effect—COVID-19 appropriate behaviours are the key to the long-term management of this pandemic. Acknowledging and understanding the Peltzman effect is therefore critical to counteract complacency and strengthen public health efforts. The public health message should be clear. Public campaign by information education and communication activities must be carried out by the government, medical personnel and the health authorities to reinforce the principles of infection control strategies. Best practice initiatives such as prioritising mask wearing regardless of vaccination status may result in greater public health benefits. In society, vaccine hesitancy must be tackled with similar actions to increase vaccination coverage rapidly.¹⁰

The pandemic is far from over; the battle is yet ongoing. Though early figures on vaccine uptake and effectiveness are encouraging, there is a perception that the third wave affecting Central Europe will inevitably 'wash up' on UK shores. The analogy to the Peltzman effect must be considered when framing national and even international COVID-19 management strategies.

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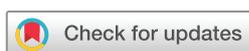
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REFERENCES

- 1 WHO Regional office for Europe. About pandemic phases. Available: <https://www.euro.who.int/en/health-topics/communicable-diseases/influenza/data-and-statistics/pandemic-influenza/about-pandemic-phases> [Accessed 04 Apr 2021].
- 2 Honigsbaum M. Spanish influenza redux: revisiting the mother of all pandemics. *Lancet* 2018;391:2492–5.
- 3 National Health Service (NHS). COVID-19 Hospital activity. Available: <https://www.england.nhs.uk/statistics/statistical-work-areas/covid-19-hospital-activity/> [Accessed 04 Apr 2021].
- 4 Press statement. Who European region: COVID-19 case incidence on the rise as deaths edge towards 1 million. Available: <https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/>

statements/statement-who-european-region-covid-19-case-incidence-on-the-rise-as-deaths-edge-towards-1-million [Accessed 04 Apr 2021].

- 5 Peltzman S. The effects of automobile safety regulation. *J Polit Econ* 1975;83:677–725.
- 6 Srivastava RK, Ish P, Covid-Vaccination Group S. The initial experience of COVID-19 vaccination from a tertiary care centre of India. *Monaldi Arch Chest Dis* 2021. doi:10.4081/monaldi.2021.1816. [Epub ahead of print: 31 Mar 2021].
- 7 Public Health England. New data show vaccines reduce severe COVID-19 in older adults. Available: <https://www.gov.uk/government/news/new-data-show-vaccines-reduce-severe-covid-19-in-older-adults> [Accessed 04 Apr 2021].
- 8 Mantzari E, Rubin GJ, Marteau TM. Is risk compensation threatening public health in the covid-19 pandemic? *BMJ* 2020;370:m2913.
- 9 Centers for Disease Control and Prevention (CDC). Benefits of getting a COVID-19 vaccine. Available: <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/vaccine-benefits.html> [Accessed 04 Apr 2021].
- 10 Iyengar KP, Vaishya R, Jain VK, *et al.* Bame community hesitancy in the UK for COVID-19 vaccine: suggested solutions. *Postgrad Med J* 2021. doi:10.1136/postgradmedj-2021-139957. [Epub ahead of print: 29 Mar 2021].