Resumption of work commute likely to cause exponential second wave of UK coronavirus cases

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The resumption of the daily work commute risks returning UK coronavirus cases to an exponential growth, according to new modelling from the University of Sussex's School of Engineering and Informatics.

The lockdown measures introduced on 23 March dramatically slowed the spread of COVID-19 in UK by limiting travel and consequently infections into largely isolated spatial clusters, new research led by Prof Maziar Nekovee at the University of Sussex indicates.

Such was the effectiveness and level of observance of the lockdown measures, the growth in the total number of infected cases in the UK has dropped from an exponential to a quadratic and now a linear increase.

Prof Nekovee said the study's results strongly indicated that mobility restrictions should not be prematurely lifted if the UK wishes to avoid a return to exponential growth of COVID-19 in a second wave.

The authors recommend that mobility should remain restricted until new measures, such as compulsive wearing of face masks, comprehensive contact tracing using mobile technology and social distancing monitoring systems for the workplace can be implemented.

Prof Nekovee said: "Our results strongly indicate that any premature lifting of mobility restrictions will result in the return of COVID-19's exponential growth in a second wave of the epidemic.

"Lockdown has greatly decelerated the growth of the epidemic and, even more significantly, has changed the key spreading mechanism of COVID-19 from a mobility-driven exponential growth to a much slower quadratic and more recently linear growth.

"We show that this dramatic deceleration of growth is a direct consequence of restriction imposed on deterministic mobility of population, i.e. for daily commutes to and from work and transportation, which has led to significant drop in UK transport use change, sectioning off the infected population into largely isolated spatial clusters in big cities, such as London and across the UK regions.

"We strongly recommend that mobility remains restricted, while other lockdown measures are cautiously lifted to allow the close monitoring of COVID-19, and any required rapid readjustment to be conducted in a controlled manner, limiting the risk of health services becoming overwhelmed by the resurgence of exponential growth."

The academics propose modifying a model initially designed to predict the spreading of Bluetooth

viruses among smartphones carried by mobile users which they believe would better capture the spread of coronavirus than the standard Susceptible-Infected-Removed (SIR) models and its variant, the Susceptible-Exposed-Infected Removed (SEIR) model.

The authors argue the conventional SIR and SEIR models assume a homogeneous mixing among population and fails to explicitly capture mobility and physical proximity of the population—a vital component of any modelling of an airborne disease with a main transmission route through respiratory droplets, in coughs, sneezes and heavy breathing, and close contacts.

The new model would better capture the reality of coronavirus transmission as it accounts for individuals moving about with deterministic velocities across metropolitan areas as seen in a work-home commute rather than just random mobility in the SIR and SEIR models, the study's authors contend.

Prof Nekovee said: "Our findings shed serious doubts on the ability of the homogenously mixed SIR/SEIR modelling to correctly guide the design and modification of the UK's response strategies to the coronavirus."

Provided by University of Sussex