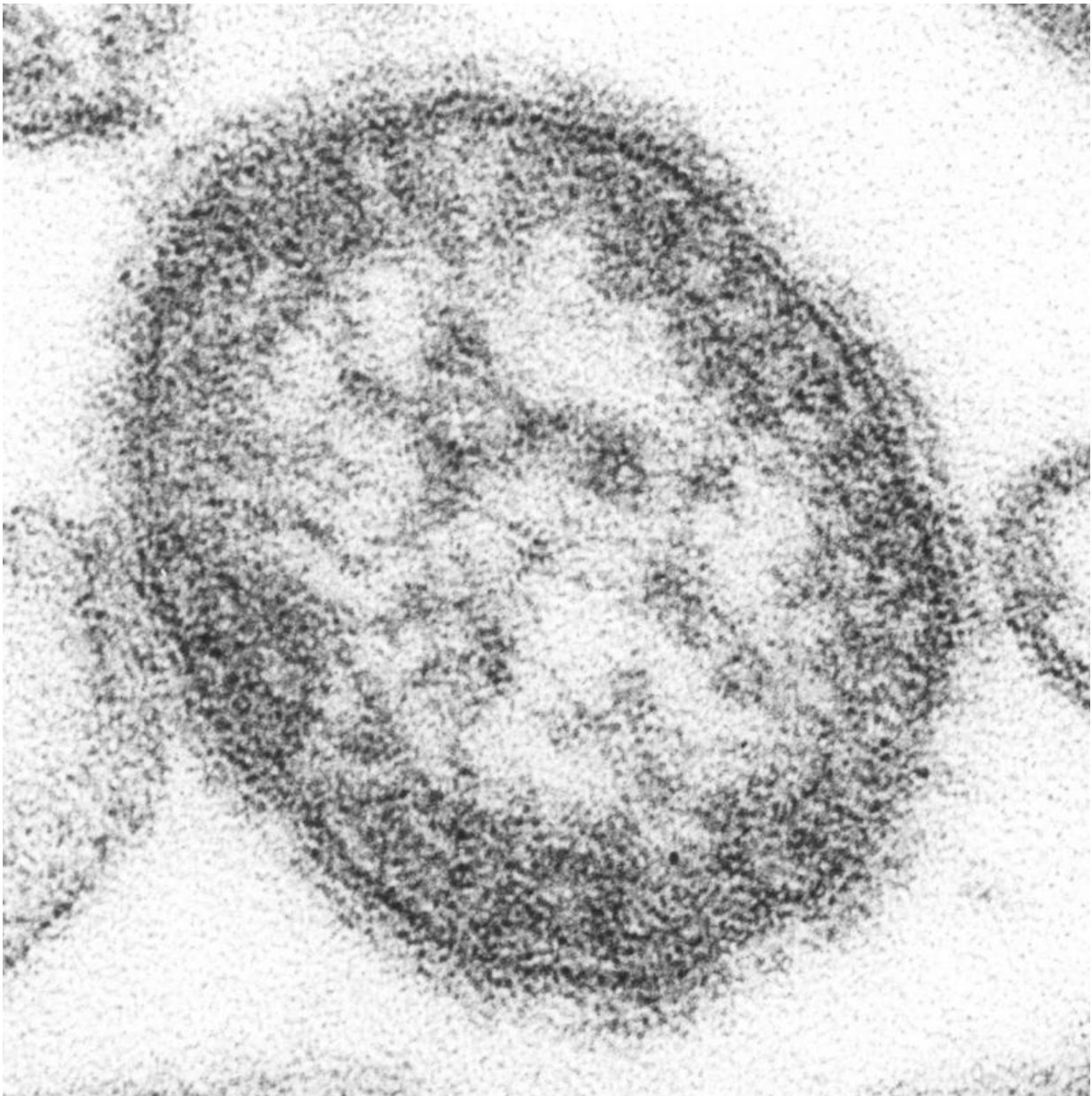


Simple model captures almost 100 years of measles dynamics in London

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An electron micrograph of the measles virus. Credit: CDC/ Courtesy of Cynthia S. Goldsmith

A simple epidemiological model accurately captures long-term measles transmission dynamics in London, including major perturbations triggered by historical events. Alexander Becker of Princeton University in New Jersey, U.S., and colleagues present these findings in *PLOS Computational Biology*.

Previous studies have extensively explored how [disease outbreaks](#) are affected by variations in demography, such as birth rate, and variations in person-to-person contact, such those arising from school calendars. However, key historical events, such as the 1918 influenza pandemic in London and the World War II evacuation of about 1 million children from London to the countryside, have not been studied in the context of long-term trajectories of disease transmission.

For the new study, Becker and colleagues aimed to mathematically disentangle the disease transmission effects of regular demographic changes, such as variable [birth rate](#), from larger shifts caused by historical events. They took advantage of recent advancements in statistical algorithms to mathematically analyze weekly measles incidence and mortality data reported in London from 1897 to 1991.

The researchers found that a simple mathematical model successfully captured measles transmission dynamics throughout the study period, including the effects of major perturbations caused by [historical events](#). "The most exciting aspect of this research is showing that the London system is able to remain mathematically stable—that is, essentially, well-predicted—in spite of multiple huge perturbations such as the 1918

pandemic and the wartime evacuation," Becker says.

The findings underscore that the long-term dynamics of epidemiological systems can follow simple rules, despite major perturbations. The results could have practical implications for understanding long-term disease dynamics in other contexts, such as the resurgence of measles seen in recent years. They could also help inform understanding of other ecological dynamics, such as predator-prey interactions.

More information: Becker AD, Wesolowski A, Bjørnstad ON, Grenfell BT (2019) Long-term dynamics of measles in London: Titrating the impact of wars, the 1918 pandemic, and vaccination. *PLoS Comput Biol* 15(9): e1007305. doi.org/10.1371/journal.pcbi.1007305

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