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New model for epidemic contagion

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Humans are considered the hosts for spreading epidemics. The speed at which an epidemic spreads is now better understood thanks to a new model accounting for the provincial nature of human mobility, according to a study published in *EPJ B*[1]. The research was conducted by a team lead by Vitaly Belik from the Massachusetts Institute of Technology, USA, who is also affiliated with the Max Planck Institute for Dynamics and Self-Organization, Germany.

The authors modelled human mobility as recurrent trips centred around a home base. The model accounted for the bi-directional travels around a central node, representing their home location and forming a star-shaped network. Previous models were based on diffusion and would imply that people travel randomly in space, not necessarily returning to their home location. These do not accurately describe the high degree of predictability in human mobility.

The researchers found that older diffusion-based models overestimated the speed at which epidemics spread. The speed of epidemics spreading through bi-directional travel, which is dependent on the travel rate, is significantly lower than the speed of epidemics spreading by diffusion.

In addition, the authors discovered that the time individuals spend outside their home locations influences the speed of epidemics spreading and whether an outbreak goes global. This contrasts with previous findings based on diffusion models, which suggested that the rate of travel between locations is the key factor influencing the global outbreak of epidemics.

This model must be tested against real data on human mobility before it can be used as a risk analysis and decision-making tool for epidemics such as avian flu. This model could also be used in areas such as population dynamics and evolutionary biology.

More information: Belik V., Geisel T., Brockmann D. (2011). Recurrent hostmobility in spatial epidemics: beyond reaction-diffusion, European Physical Journal B (EPJ B) 84, 579-587 DOI: 10.1140/epjb/e2011-20485-2