Modelling the spread of infectious diseases via global airline transportation

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Keywords: influenza modelling, long distance travel networks, delay differential equations

National boundaries never hindered infectious diseases to reach distant territories; however, the speed at which an infectious agent now can spread around the world has signicantly increased in the last 50 years. We introduce an SEAIR-based model for long distance travel networks, which describes the dynamics of a pandemic on regions connected by air transportation. Due to the high connectedness of several distant places, we include the possibility of transmission of the disease during travel, which is modeled by an age structured system where age is the time elapsed since the start of the travel. The model is equivalent to a large system of delay differential equations, we examine fundamental properties of the system. We detail the method of the calculation of the reproduction number, and parametrize the model with influenza and real air traffic data.

References

[1] DH Knipl, G Röst, J Wu, *Epidemic spread of infectious diseases on long distance travel networks*, preprint 2012.