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Developing an Infectiousness model for droplet transmission

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Modelling of clinical public health data in clinical spaces guided by principles of physics can produce safer environments. Understanding airborne transmission of viruses is essential considering the recent worldwide SARS-CoV-2 pandemic. More understanding can help define better public health strategies to adopt and to design public spaces in such a way that humanity is no longer vulnerable to airborne transmission. Infectious saliva droplets are the principal factor of transmission and are associated with the magnitude of viral load. There is a need to consider the effects of local environmental factors on the evolution of droplet infectiousness. This work aims to develop a computational fluid dynamics model that incorporates heat and mass transfer to account for droplet evaporation. A computational fluid dynamics approach is applied to simulating droplet time evolution. An Eulerian-Lagrangian approach was used to simulate air and particle flow. These flows were calculated using a two-way coupling method. Interactions between droplets are captured with coalescence and breakup models. Infectiousness is lowered by temperature, time and windspeed whereas humidity acts on infectiousness in such a way that it decreases less rapidly over time. Thus indoor spaces should be well ventilated. The results are benchmarked to measurement and other computational based methods and studies. The aim is to use the model to optimise the design of clinical and public spaces with optimal ventilation to minimise the risk of infection.

Apply to be considered for a student ; award (Yes / No)?

No

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N/A

Primary authors: RALIJAONA, Mbolahasina (University of Johannesburg); IGUMBOR, Emmanuel (University of Johannesburg); BHAMJEE, Muaaz (University of Johannesburg); CONNELL, Simon (University of Johannesburg); MARTINSON, Neil (Perinatal HIV Research Unit); OTWOMBE, Kennedy (Perinatal HIV Research Unit); GROBLER, Hennie (University of Johannesburg)

Presenter: RALIJAONA, Mbolahasina (University of Johannesburg)

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