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Mitigating transmission in a shared meeting room scenario

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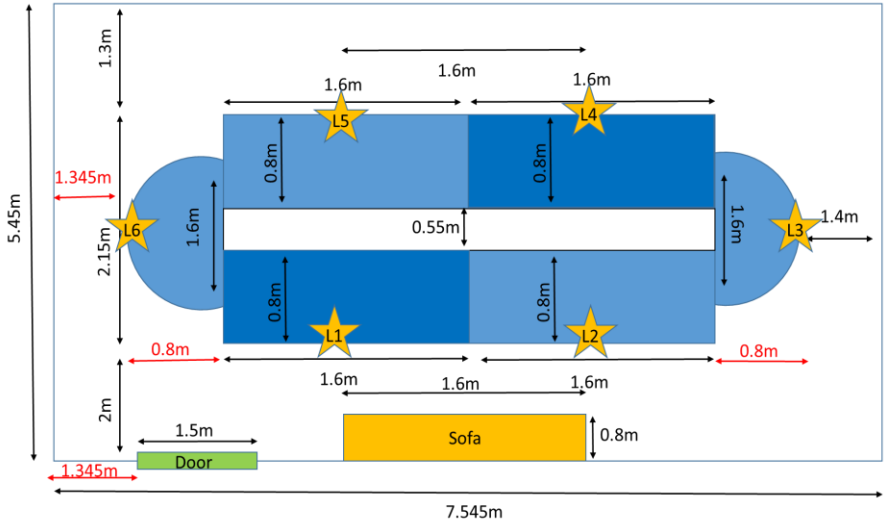
PROTECT Researcher Symposium 5-6 May 2022

Introduction

- QMRA[1] modelling was performed by Dstl using M3IVT[2] to simulate exposure in a meeting room scenario with:
  - Two, two hour meetings (9:00-11:00 and 12:00-14:00)
  - Six occupants per meeting
    - One infectious in first meeting who begins with contaminated hands and speaks (but doesn't cough or sneeze)
  - Ventilation of 3.42 air changes per hour ($0.1015\ m^3 \cdot s^{-1}$ and $16.9\ L \cdot s^{-1} \cdot person^{-1}$)
  - Occupants touch door handles and possibly drink container as they enter
- 500 stochastic simulations are performed for each scenario



[1]Quantitative Microbial Risk Assessment
[2]Mechanistic Multi-route Model of Indoor Viral Transmission

Which route of transmission produces the largest dose?

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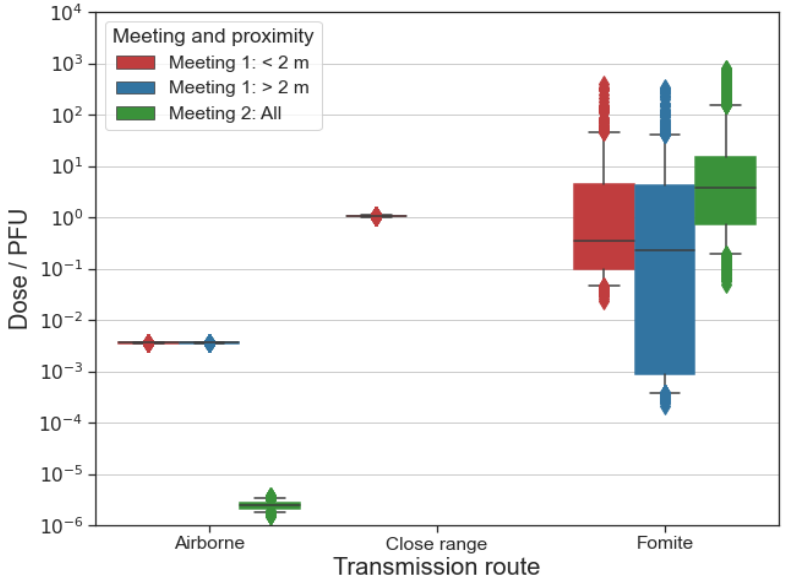
- Figure (R) shows the dose received by occupants split by route of transmission and occupant group
- Order and magnitude depends upon the initial hand contamination of the infected occupant and their respiratory activity[1]
- The fomite dose is dominant
  - Outliers of the fomite route are the highest of all routes (and provide the highest risk)
  - Fomite dose is the highest risk for meeting 2 occupants (in this scenario)
  - Exception is the median close-range dose which is highest for meeting 1 occupants < 2m
  - Airborne dose is small in comparison



[1]Here there is no coughing or sneezing and the infected occupants hand contamination comes from a distribution

How can we mitigate fomite transmission?

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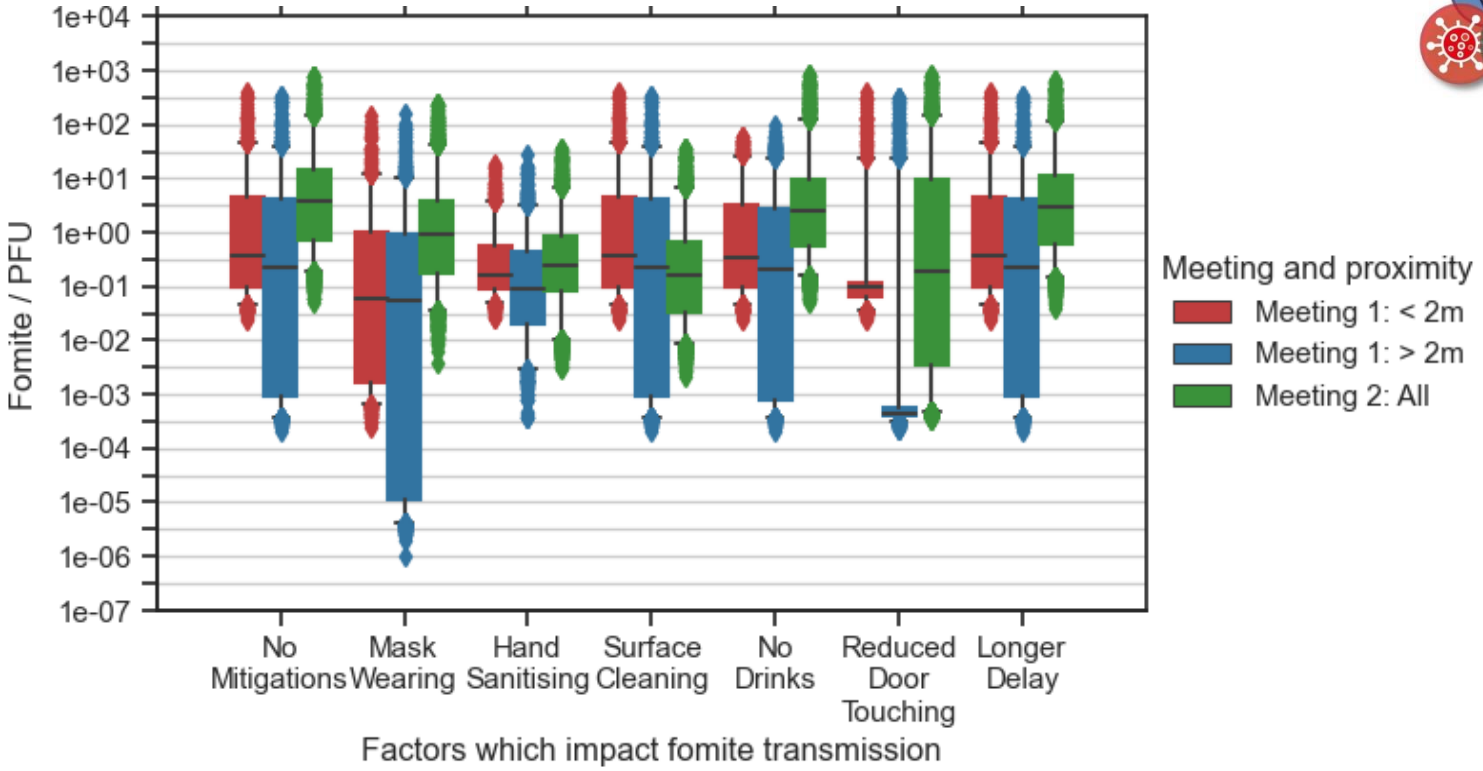

Conclusions

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- For the assumptions used here, fomite doses were found to produce the highest doses (and therefore likely present the highest risk to occupants).
- Mask wearing significantly reduced the fomite dose received
- Reducing touching of shared surfaces (particularly door handles) was found to be particularly effective at reducing the average dose for meeting one occupants.
- Cleaning hands and surfaces was found to significantly reduce the risk for meeting two occupants.
- It should be noted that airborne exposure was found to be more significant when sneezing and a higher viral load were included.
- Further work is currently in progress using an office environment with multiple zones (see Hugh Gallagher's poster).
- Additional information on the meeting room scenario modelling may be found within [1].

[1]Parker, ST, Miller, D, Cooper, H, Lloyd-Williams, S, Higgins, B, Gallagher, H. Quantitative Microbial Risk Assessment modelling of SARS-CoV-2 transmission in workplaces – FY21/22 final report. Customer report DSTL/CR138859 V1.0, Dstl, 2022

Acknowledgements

- Dstl's QMRA modelling team
- Colleagues from within NCS PROTECT who provided input:
  - Theme 1
  - Theme 2
    - Wide range of colleagues, including those in:
      - WP 2.1 – QMRA and transmission modelling
      - WP 2.2.1 – deposition rates
      - WP 2.2.4 – surface transfer

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How impactful is reducing door touching?

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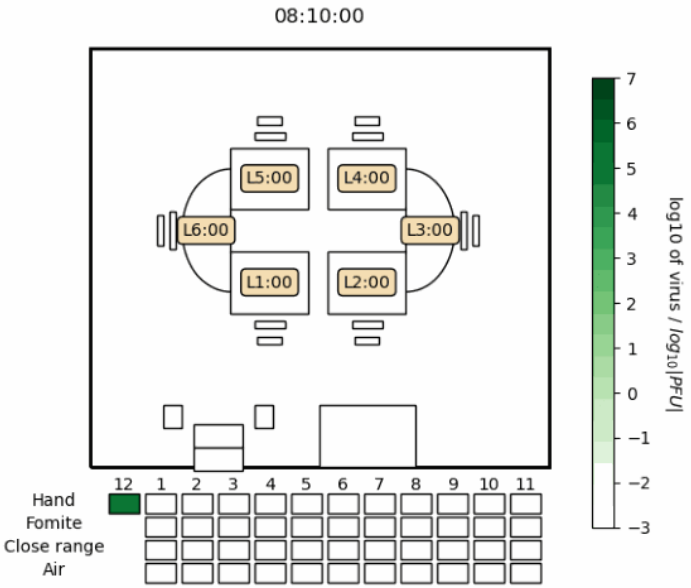
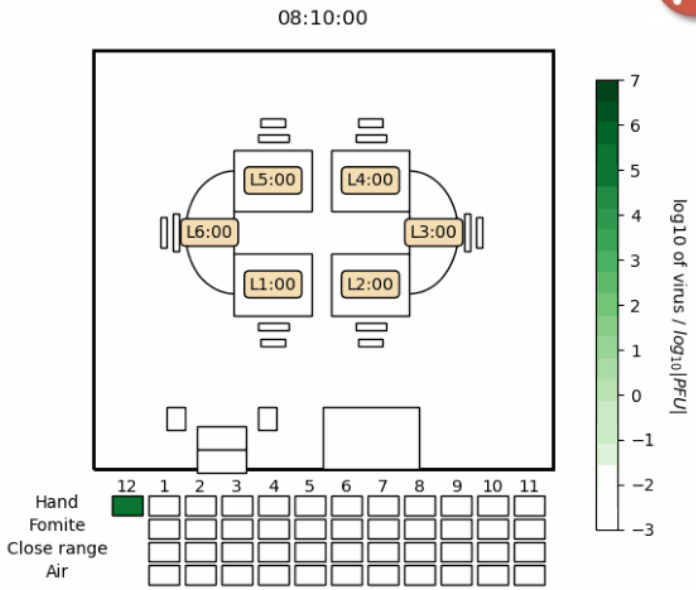
Defaults



Reduced door touching



Animation explainer

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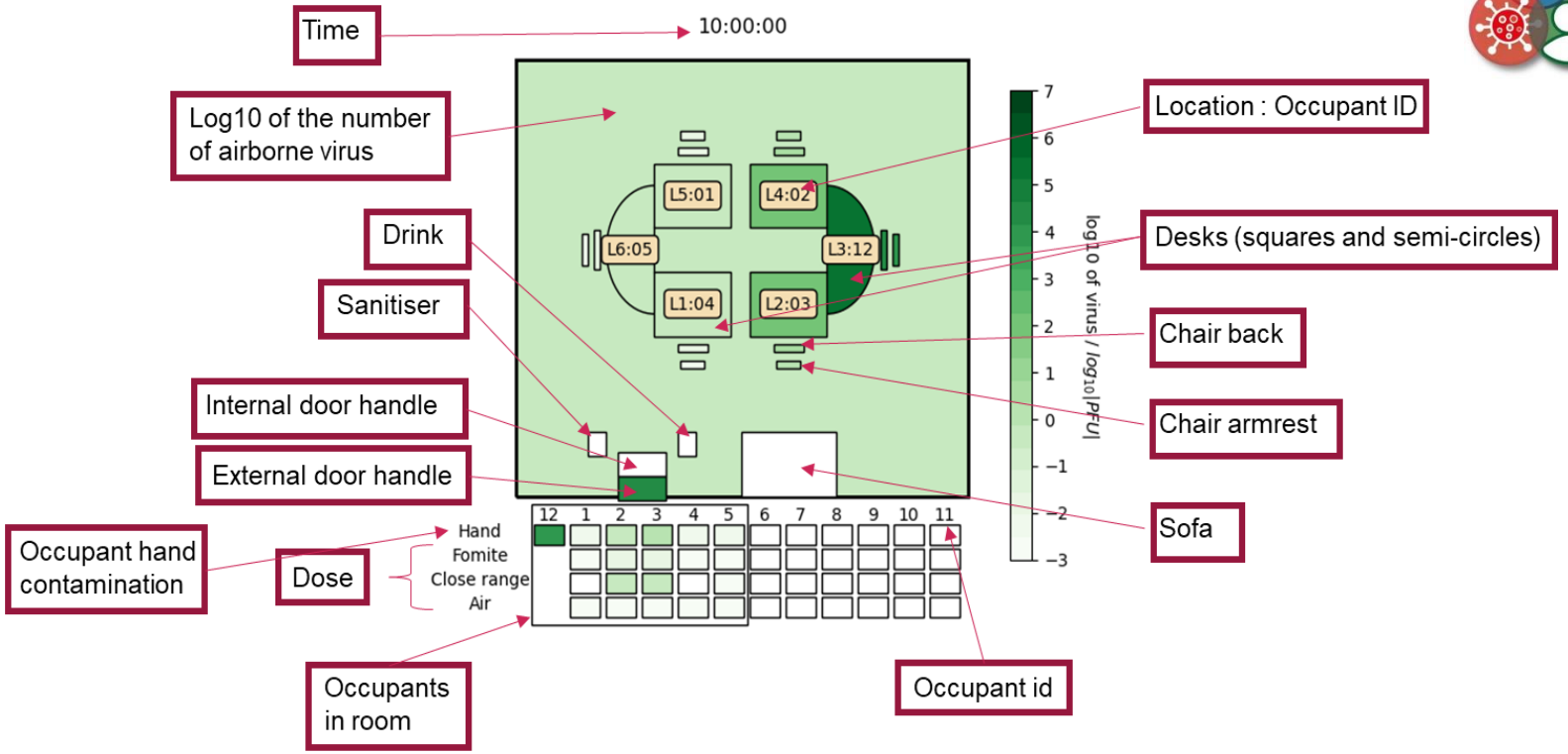

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Mechanistic Multi-route Model of Indoor Viral Transmission (M3IVT)

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- The Mechanistic Multi-route Model of Indoor Viral Transmission (M3IVT) is a QMRA model that estimates exposure to SARS-CoV-2 via three transmission routes:
  - Close-range (< 2m)
  - Long range airborne
  - Fomite
- The latest version of M3IVT can handle complex inputs including:
  - Multiple rooms
  - Groups of occupants with different entry/exit times and characteristics (viral load, hand size, touching frequency etc.)
  - User specified and/or random (at a specified frequency) touching patterns to surfaces and mucous membranes
  - Scheduled cleaning
  - A wide variety of “events” such as coughs, meetings and movement
- It can account for mechanistic effects on viral exposure including, but not limited to:
  - Distance to infectious individual
  - Mask wearing
  - Ventilation