**README**

**List of Supporting Information items, with short explanations**

All **T**exts are in a single Word file SI-Tx, with each text as a separate section, shown in the Contents in page 1.

All spreadsheets are in a single master **W**orkbook SI-Wx, with each file in a separate worksheet. The ***Survey*** starting worksheet has hyperlinks to all worksheets in content.

**SI-Tx Text Files Surveyed**

**Definitions and Reference Data**

SI-T1 Definitions & Measurements

Includes definitions of COVID-19 and various droplets.

SI-T2 Reference Data for Modelling

Extended version of Section 2.4.

**Model Description Closed Spaces**

The model as described is applied in two steps, first the concentrations and next the potential exposures resulting. The model also creates Figure 3 without an intermediate step of producing a data set.

SI-T3 Model Description Closed Spaces

Shows mechanisms of concentrations dynamics and exposures accumulation. It allows for own implementation.

SI-T4 Spreadsheet Modelling Structure of SI-W16 Visualized per Step

The stepwise modelling shows how increasing inflow, virion decay and ventilation interact.

SI-T5 Exhales– Exposure modelling options, Open and Closed Spaces

Single exhales diffusion specified and combined with air transport.

SI-T6 Measured concentrations at three locations and three wind speeds, after Wu et al (2018)

Forms the basis for one outside cone model approach.

SI-T7 Model description open air gathering

It forms the basis for the data in Table 2 and creates Figure 4.

**Results for situations**

SI-T8 Forty exposure situations evaluated

Verbal evaluation of typical situations, with numerical specifications somewhat loosened relative to the detailed scenario outcomes in SI-W21 and SI-W22.

**Detailed description of fluid and solid exposures**

SI-T9 Direct and Indirect Fluid and Solid Exposures

This text gives details for the short Section 4.7 in the main text.

**SI-Wx Workbook with Worksheets Surveyed**

**Spreadsheet Model for SARS-CoV-2 Pneumonia Development**

This spreadsheet describes exponentially rising SARS-2 virion production and emissions in an unconstrained alveolar infected person. It is **not** a prediction from Day 1.

Development towards SARS-CoV-2 pneumonia has a minimum starting infection which expands exponentially with a speed depending on the general defenses of the person involved. Lowest exposure is on day 1. High exposures imply a start as would be reached by the minimum starting infection days later. As soon as SARS-specific defenses build up, or medicines are given, the exponential rise diminishes and may reverse in a decline.

Basic input data may easily be varied: on speed of replication; share of intact virions towards new alveoli infection or to airways; share swallowed or exhaled.

SI-W1 Spreadsheet Model for SARS-CoV-2 Pneumonia Development

**Spaces with Special Ventilation**

Some spaces have highly irregular forms, such as the inside of person cars and passenger airplanes. We specify the airplane room here based on industry data for a two-ails widebody. Ventilation in the airplane is not fully mixed and more flow oriented, possibly more efficient for a given ventilation rate. We approach it with the fully mixed model.

SI-W2 Airplane Person Density and Ventilation

**Stocks and Concentrations Development in Closed Spaces**

Development per m3, with different Emission Times and HalfLifes

SI-W3 Stock and Concentration Development with HalfLife 15 Minutes

SI-W4Stock and Concentration Development with HalfLife 30 Minutes

SI-W5 Stock and Concentration Development with HalfLife 60 Minutes

SI-W6 Stock and Concentration Development with HalfLife 120 Minutes (Standard)

SI-W7 Stock and Concentration Development with HalfLife 180 Minutes

SI-W8 Room Concentrations compared to those of Lednicky et al. (2020)

**Exposures in Closed Spaces**

Exposures in Closed Spaces, depending on Time of Emission Start and Period of Stay.

The tables are derived from the model as described in SI-4.a. The duration times of emission when a person enters varies from 1 minute to 48 hours. The period of stay varies between 1 minute and 2880 minutes (2 days). The exposures are quantified for a standard space of 20m3 with one standard person emitting 100,000 virions per hour and rising. This is equivalent to five emitting standard persons in a space of 100m3 and five standard emitters. The second variable is the Ventilation Rate, with VRs ranging from VR0 to VR60.

Exposures are potential exposures, without any SARS-2 control measures in place.

SI-W9 Exposures under HalfLife 15

SI-W10 Exposures under HalfLife 30

SI-W11 Exposures under HalfLife 60

SI-W12 Exposures under HalfLife 120 (standard)

SI-W13 Exposures under HalfLife 180

SI-W14 Table 1 Exposures all times-all periods-all half-lives and all VRs

With color indication of risk levels at durations of stay

SI-W15 Table 2 Exposures HL120-all times-periods and VRS

With color indications per risk level

**Spreadsheet Model for Concentrations & Exposures**

The spreadsheet is open for easy changes in input data. It is a not-continuous step model, per minute, see the barrel visualization in SI-T4.

SI-W16 Spreadsheet model for concentrations and exposures

**Droplets with Virions and Mass Relations by Size**

Virion concentrations tend to be given per watery volume, as per ml. We compute the number of virions per spherical droplet, their sizes measured in diameter. As volume goes by the cube of the radius, the volume size differences towards single virion size are extreme, see SI-W17 Droplets below 5 micrometer evaporate before inhaling or touching the ground, and between 5 and 10 micrometer evaporation depends on circumstances. Measurement of such small sized droplets is possible in lab situations only. Real-life measurements of the number of viable virions in these small droplets are nearly fully lacking but see Lednicky, also in the main text.

SI-W17 Virion Content of Droplets and Mass Relations

**Virions in Stool**

Virions concentrations in stool as measured in PCR-type tests can be very substantial. However, they might not all be viable. We use the PCR-based numbers as an extreme exercise, indicating the need for better measurement of viable virions. There are a few studies finding viable SARS-2 virions in stool, and all without relevant quantification.

SI-W18 Virions in Stool

**Exhale Flows Modelling Options in Closed and Open Spaces**

Exhales diffuse due to the composition and kinetics of the exhales. The resulting dilution is covered in an expanding cone, in the literature mostly set at 40 degrees, with speed reduced to low levels within half a meter. Inside diffusion is covered by these measurements and – limited – modelling. These data have been used in the main text.

Outside, even a low level of wind transports the virions while diluting them further. Empirical measurements close to our scale level of up to 15m are not available. There is one near exception covering the distance of over 180 meter. From these data it could be concluded that dilution is constant per distance, though faster winds result in this dilution faster. This corresponds to a constant opening dilution cone outside as well. It has been set at a much smaller cone opening of 10 degrees. A more detailed description in SI-W5.

SI-W19 Exhales Exposures: Cone Models and a Virtual Room Model

SI-W20 Concentration Reductions by Distance after Wu et al. (2018)

Visual analysis with numbers is SI-W6.

**Situations and Scenarios Quantified and Assessed**

Common situations are combined with exposures resulting from time of stay, distance from exhalers, and other options for exposure. In SI-W21. each situation is combined with relevant exposure scenarios. In SI-W22 all situations with exposure levels are ordered as to level of potential exposure. Each situation is very shortly evaluated as to the quantified results, in SI-T8. A selection of the results in SI-W23, for space reasons, is in SI-W23

SI-W21 Situations quantified with their scenarios

SI-W22 Scenarios ordered as to potential exposures

SI-W23 Selection of scenarios in SI-W22 for Table 3 in the paper.

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