Brief Analysis of Norovirus Data

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An in depth study on norovirus outbreaks in hospital settings, with one of three intervention strategies put in place (including control). Using resources from Gaythorpe[3][4], the SA health department[2] and Ross et al[1], a statistical model is derived to calculate the infectivity of the disease within hospitals. The study finds that each individual who is infected is expected to infect another 2 people. Or specifically, the reproduction number (the expected number of people infected by one individual) is approximately 2.2883 when there is no intervention strategy (T_0). When the strategy T_1 is put in place, This value is reduced to approximately 1.9242, corresponding to the expectation that an individual will infect just under two people over their infectious period. This is an improvement on T_0, and hence intervention will help reduce the effect of norovirus outbreaks. Intervention strategy two, T_2, reduces the value to approximately 1.5518. This is a much greater improvement on the control, and hence strategy T_2 should be put in place.
These values are obtained using a statistical estimate, and obtaining the average (modal) value. The distributions for R_0, α_1 and α_2 are shown in figure 1, where R_0 is the reproduction number, α_1 and α_2 multiply with R_0 to get the effective reproduction numbers under T_1 and T_2 respectively. The values stated above correspond to the peaks on these plots, but it is worth acknowledging that there is a reasonable probability that R_0 could be between 2 and 2.6 and α_1 could even be greater than 1, corresponding to an *increase* in infectivity under T_1.

As a result of this analysis, more alternative intervention strategies should be investigated. In the meantime, intervention strategy T_2 should be put in place as it will greatly decrease the spread of norovirus within hospital environments.

References

[1] Andrew J. Black and J.V. Ross. "Computation of epidemic final size distributions". In: *Journal of Theoretical Biology* 367 (2015), pp. 159–165. ISSN: 0022-5193. DOI: https://doi.org/10.1016/j.jtbi.2014.11.029. URL: http://www.sciencedirect.com/science/article/pii/S0022519314006882.

[2] South Australian Health Department. *Norovirus infection*. URL: https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/health+topics/health+conditions+prevention+and+treatment/infectious+diseases/norovirus+infection.

[3] K. A. M Gaythorpe et al. "Norovirus transmission dynamics: a modelling review". In: 146.2 (2018), pp. 147–158. ISSN: 0950-2688.

[4] K.A.M. Gaythorpe, C.L. Trotter, and A.J.K. Conlan. "Modelling norovirus transmission and vaccination". eng. In: *Vaccine* 36.37 (2018), pp. 5565–5571. ISSN: 0264-410X.

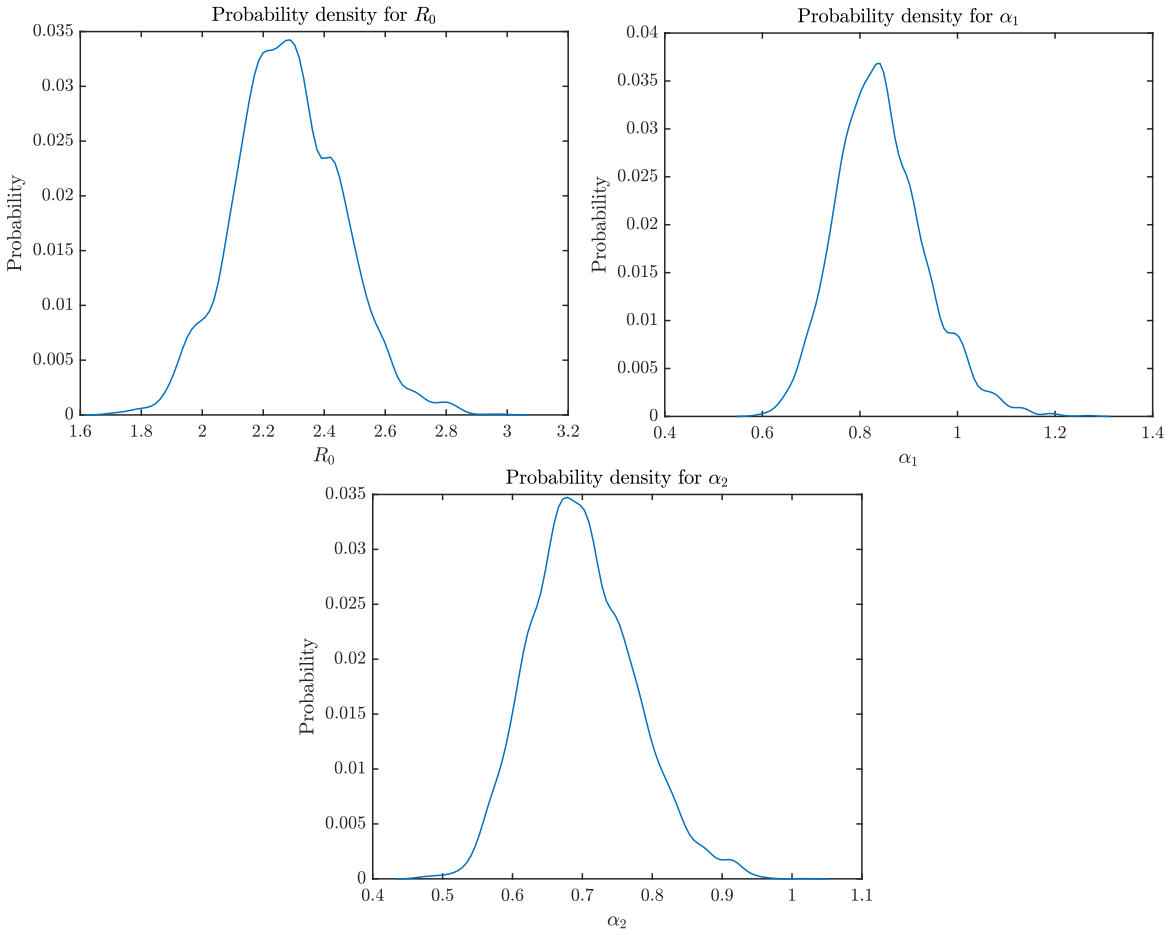

Figure 1: Probability density curves for the parameters - the horizontal axis is the parameter while the vertical is the probability