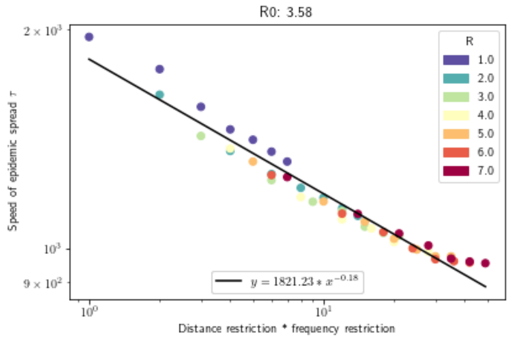
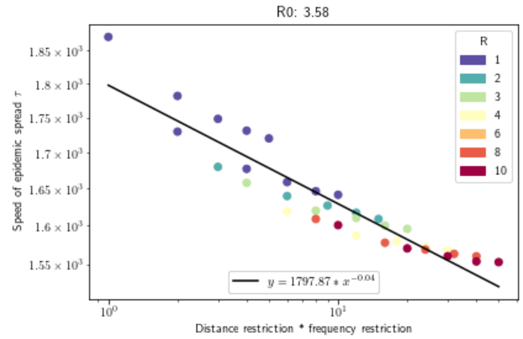
Travel distance, frequency of return and the spread of disease

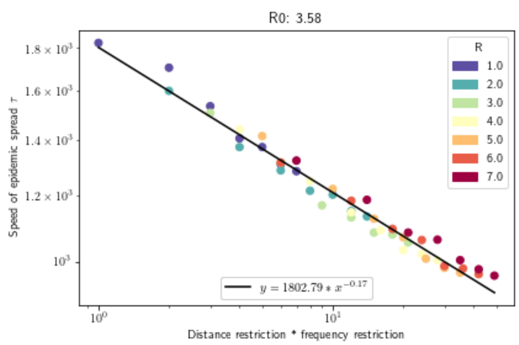
Supplementary Material



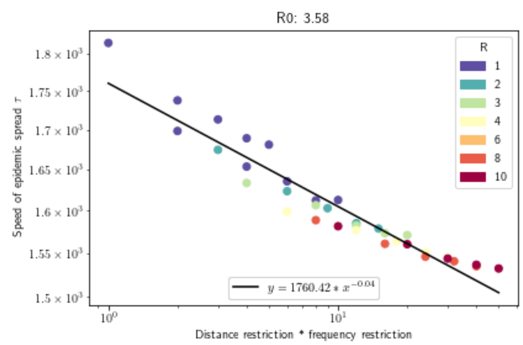
(a) NYC



(b) Dakar

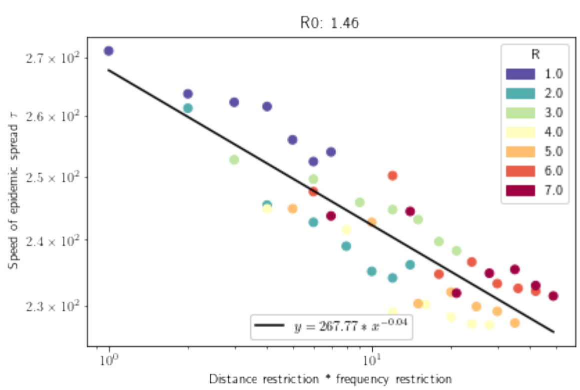


(c) NYC



(d) Dakar

Figure S1. Scaling collapse in SI and SIR model. Top row: scaling collapse for SI model. R^2 values for best-fit lines are, from left to right, .958 and .896. Best-fit line parameters are $a = -0.18, b = 1821.23$ (NYC) and $a = -0.04, b = 1797.87$ (Dakar). Bottom row, scaling collapse for SIR model. R^2 values for best-fit lines are, from left to right, .974 and .937. Best-fit line parameters are $a = -0.17, b = 1802.79$ (NYC) and $a = -0.04, b = 1760.42$ (Dakar).



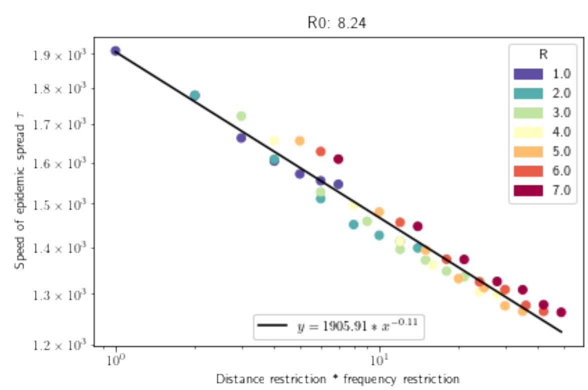


Figure S2. Epidemics sizes for NYC covid outbreak with lower $R_0 = 1.46$ (similar to the H1N1 epidemic) and higher $R_0 = 8.2$ (similar to the upper estimates of COVID-19 Delta variant contagion), suggesting the scaling collapse is robust. R^2 of best-fit lines are .925 and .9625, respectively.

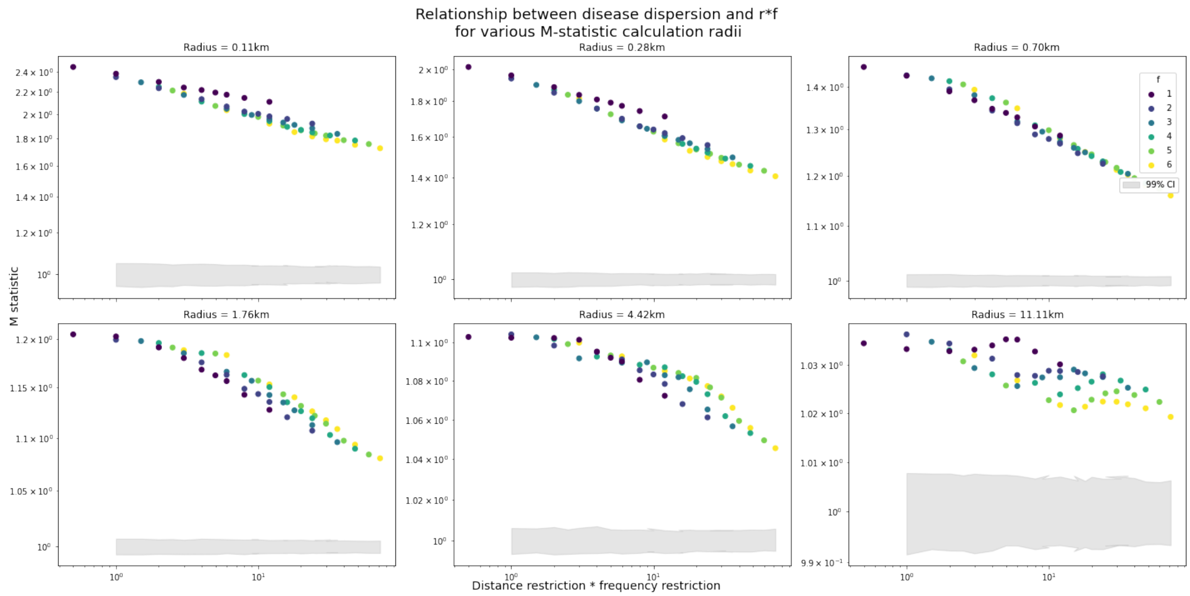
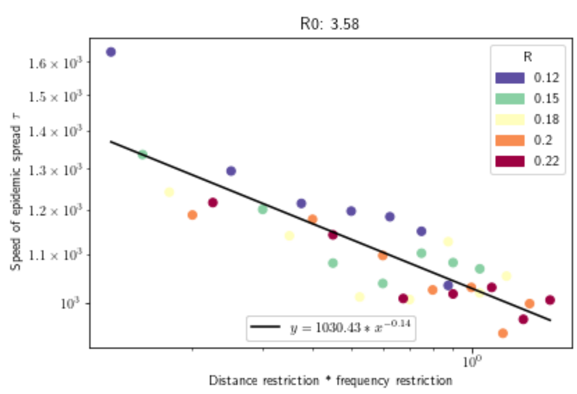
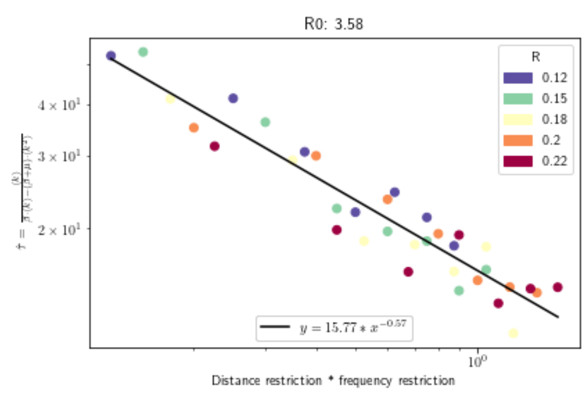


Figure S3. Collapse of spatial dispersion of infections for varius k. Spatial dispersion $M(k)$ shows a scaling relationship with $r \cdot f$ regardless of k. 99% confidence bands are shown in gray, indicating that the spatial clustering in infections remains significant across values of $r \cdot f$.



(a) Relationship between distance restriction and τ in PEPR simulations.



(b) Relationship between distance restriction and $\hat{\tau}$ as predicted by $\langle k \rangle$, $\langle k^2 \rangle$ in PEPR simulations.

Figure S4. PEPR simulation results, where $P_{\text{travel}} = .40$. When we run SEIR models across a set of trajectories M_{sim} which have been created using the PEPR model with $P_{\text{travel}} = .40$, we see a similar relationship between $r \cdot f$ and τ to that in our real trajectories M_{real}.