Supporting Information for:
“The required size of cluster randomized trials of non-pharmaceutical interventions in epidemic settings”
Statistics in Medicine

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Appendix 1. Approximate Variance Derivations

A. Approximation Under Full Testing

Suppose there are \( N_1 \) intervention and \( N_0 \) control clusters. For simplicity, we assume that each cluster has \( n \) individuals. At time \( t \) (immediately before the intervention occurs) and \( t+1 \) (one generation interval after beginning the intervention), we sample \( m_1 \) individuals from each cluster and record whether they test positive. Denote the number of individuals who test positive in cluster \( j \) at times \( t \) and \( t+1 \) by \( Y_{j,t} \) and \( Y_{j,t+1} \), respectively. Let \( I_t \) and \( I_{t+1} \) be random variables representing the proportion of individuals infected at times \( t \) and \( t+1 \), respectively, in a randomly-chosen cluster.

Assume that each cluster has time-varying effective reproductive number \( R^i_t \) at time \( t \) (looking forward) and overdispersion parameter \( k^i \), where \( i = C \) for clusters in the control arm and \( i = I \) for clusters in the intervention arm. Then \( I_{t+1} \) and \( I_t \) are related by:

\[
I_{j,t+1}|I_{j,t} = \frac{1}{n} \sum_{\ell=1}^{nI_{j,t}} Q_{j,\ell}, \text{ where} \\
Q_{j,\ell} \sim \text{NegBin}(R^i_t, k^i) \forall \ell.
\]

First, assume that we test the full population (all individuals) within each cluster at both time \( t \) and \( t+1 \), so that \( m_1 = n \). Then \( Y_{j,t+1} = nI_{j,t+1} \) and \( Y_{j,t} = nI_{j,t} \). For each cluster \( j \) we can then calculate the expectation and approximate the variance of the statistic \( \frac{Y_{j,t+1}}{Y_{j,t}} \).

For any cluster \( j \) in arm \( i \):

\[
E[I_{j,t+1}|I_{j,t}] = I_t R^i_t, \\
Var(I_{j,t+1}|I_{j,t}) = \frac{I_t}{n} R^i_t \left( 1 + \frac{R^i_t}{k^i} \right), \\
E[Y_{j,t+1}|Y_{j,t}] = nE\left[ I_{j,t+1}|I_{j,t} = \frac{Y_{j,t}}{n} \right] \\
= n \frac{Y_{j,t}}{n} R^i_t = Y_{j,t} R^i_t, \\
Var(Y_{j,t+1}|Y_{j,t}) = n^2 Var\left( I_{j,t+1}|I_{j,t} = \frac{Y_{j,t}}{n} \right) \\
= n^2 \frac{Y_{j,t}}{n^2} R^i_t \left( 1 + \frac{R^i_t}{k^i} \right) \\
= Y_{j,t} R^i_t \left( 1 + \frac{R^i_t}{k^i} \right).
\]
Now, turning to the test statistic:

\[
E \left[ \frac{Y_{j,t+1}}{Y_{j,t}} \right] = E \left[ E \left[ \frac{Y_{j,t+1}}{Y_{j,t}} | Y_{j,t} \right] \right] = E \left( \frac{Y_{j,t} R_t^i}{Y_{j,t}} \right) = E[R_t^i].
\]

\[
Var \left( \frac{Y_{j,t+1}}{Y_{j,t}} \right) = E \left[ Var \left( \frac{Y_{j,t+1}}{Y_{j,t}} | Y_{j,t} \right) \right] + Var \left( E \left[ \frac{Y_{j,t+1}}{Y_{j,t}} | Y_{j,t} \right] \right) = E \left( \frac{R_t^i (1 + R_t^i / k^i)}{Y_{j,t}} \right) + Var(R_t^i) = R_t^i \left( 1 + \frac{R_t^i}{k^i} \right) E \left[ \frac{1}{Y_{j,t}} \right],
\]

under the assumption that \( R_t^i \) and \( k^i \) are equal across clusters within arm \( i \) (but may vary across arms). Now, using a Taylor series for \( \frac{1}{Y_{j,t}} \) around \( \frac{1}{E[Y_{j,t}]} \), we can approximate \( E \left[ \frac{1}{Y_{j,t}} \right] \) by:

\[
E \left[ \frac{1}{Y_{j,t}} \right] = E \left( \frac{1}{E[Y_{j,t}]} - \frac{Y_{j,t} - E[Y_{j,t}]}{E[Y_{j,t}]^2} + \frac{(Y_{j,t} - E[Y_{j,t}])^2}{E[Y_{j,t}]^3} - \cdots \right) = \frac{1}{E[Y_{j,t}]} - 0 + \frac{Var(Y_{j,t})}{E[Y_{j,t}]^3} - \cdots
\]

And thus we can bound the expectation \( E \left[ \frac{1}{Y_{j,t}} \right] \) by:

\[
\frac{1}{E[Y_{j,t}]} \leq E \left[ \frac{1}{Y_{j,t}} \right] \leq \frac{1}{E[Y_{j,t}]} + \frac{Var(Y_{j,t})}{E[Y_{j,t}]^3}.
\]

So we can bound the variance in each cluster \( j \) in arm \( i \) by:

\[
R_t^i \left( 1 + \frac{R_t^i}{k^i} \right) \frac{1}{E[Y_{j,t}]} \leq Var \left( \frac{Y_{j,t+1}}{Y_{j,t}} \right) \leq R_t^i \left( 1 + \frac{R_t^i}{k^i} \right) \left( \frac{1}{E[Y_{j,t}]} + \frac{Var(Y_{j,t})}{E[Y_{j,t}]^3} \right).
\]

Equivalently, using \( I_{j,t} \) and \( I_{j,t+1} \):

\[
R_t^i \left( 1 + \frac{R_t^i}{k^i} \right) \frac{1}{nE[I_{j,t}]} \leq Var \left( \frac{Y_{j,t+1}}{Y_{j,t}} \right) \leq R_t^i \left( 1 + \frac{R_t^i}{k^i} \right) \left( \frac{1}{nE[I_{j,t}]} + \frac{Var(I_{j,t})}{nE[I_{j,t}]^3} \right).
\]

**B. Approximate Variance Accounting for Sampling**

Here we use the same notation and epidemic spread assumptions as the previous section, but we now take \( m_1 \) to be small relative to \( n \) (i.e., we have random sampling and ignore any finite population correction).
For any cluster $j$ in intervention arm $i$, we can find the mean and variance of $Y_{j,t+1}$:

$$Y_{j,t+1}|I_{j,t+1} \sim Bin(m, I_{j,t+1}).$$

$$E[Y_{j,t+1}|I_{j,t}] = E[E[Y_{j,t+1}|I_{j,t}, I_{j,t+1}]|I_{j,t}]$$

$$= E[m_1I_{j,t+1}|I_{j,t}] = m_1E\left[\frac{1}{n} \sum_{t=1}^{nI_{j,t}} Q_{j,t}|I_{j,t}\right]$$

$$= m_1\frac{1}{n}(nI_{j,t})R_i^t = m_1I_{j,t}R_i^t.$$

$$Var(Y_{j,t+1}|I_{j,t}) = E[Var(Y_{j,t+1}|I_{j,t+1})|I_{j,t}] + Var(E[Y_{j,t+1}|I_{j,t+1}]|I_{j,t})$$

$$= E[m_1I_{j,t+1}(1 - I_{j,t+1})|I_{j,t}] + Var(m_1I_{j,t+1}|I_{j,t})$$

$$= m_1(E[I_{j,t+1}|I_{j,t}] - E[I_{j,t+1}^2|I_{j,t}]) + m_1^2Var(I_{j,t+1}|I_{j,t})$$

$$= m_1(E[I_{j,t+1}|I_{j,t}] - Var(I_{j,t+1}|I_{j,t}) - E[I_{j,t+1}|I_{j,t}]^2) + m_1^2Var(I_{j,t+1}|I_{j,t})$$

$$= m_1E[I_{j,t+1}|I_{j,t}] (1 - E[I_{j,t+1}|I_{j,t}]) + m_1(m_1 - 1)Var(I_{j,t+1}|I_{j,t})$$

$$= m_1I_{j,t}R_i^t(1 - I_{j,t}R_i^t) + m_1(m_1 - 1)\frac{I_{j,t}}{n}R_i^t(1 + R_i^t/k^i).$$

$$E[Y_{j,t+1}] = m_1R_i^tE[I_{j,t}].$$

$$Var(Y_{j,t+1}) = Var(E[Y_{j,t+1}|I_{j,t}]) + E[Var(Y_{j,t+1}|I_{j,t})]$$

$$= m_1^2(R_i^t)^2Var(I_{j,t}) + m_1R_i^tE[I_{j,t}(1 - I_{j,t}R_i^t)] + \frac{m_1(m_1 - 1)R_i^t(1 + R_i^t/k^i)}{n}E[I_{j,t}]$$

$$= m_1R_i^t\left[ (m_1 - 1)R_i^tVar(I_{j,t}) - R_i^tE[I_{j,t}]^2 + E[I_{j,t}] \left( 1 + \frac{m_1 - 1}{n} \left[ 1 + \frac{R_i^t}{k^i} \right] \right) \right].$$

Suppose that we sampled everyone in the cluster at time $t$. Then we could use the statistic $\frac{Y_{j,t+1}/m_1}{I_{j,t}}$ to estimate $R_i^t$ in cluster $j$ in arm $i$.

$$E\left[ \frac{Y_{j,t+1}}{m_1I_{j,t}} \right] = E\left[ \frac{E[Y_{j,t+1}|I_{j,t}]}{m_1I_{j,t}} \right] = E[R_i^t] = R_i^t.$$

$$Var\left( \frac{Y_{j,t+1}}{m_1I_{j,t}} \right) = E\left[ \frac{Var(Y_{j,t+1}|I_{j,t})}{m_1^2I_{j,t}^2} \right] + Var\left( \frac{E[Y_{j,t+1}|I_{j,t}]}{m_1I_{j,t}} \right)$$

$$= E\left[ \frac{R_i^t(1 - I_{j,t}R_i^t)}{m_1I_{j,t}} \right] + \frac{m_1 - 1}{m_1} \frac{1}{nI_{j,t}}R_i^t(1 + R_i^t/k^i) + Var(R_i^t)$$

$$= \frac{R_i^t}{m_1} E\left[ \frac{1}{I_{j,t}} \right] - \frac{(R_i^t)^2}{m_1} + \frac{m_1 - 1}{m_1} \frac{1}{nI_{j,t}} R_i^t(1 + R_i^t/k) E\left[ \frac{1}{I_{j,t}} \right].$$

Similar to the previous section, by a Taylor series, we can bound $E\left[ \frac{1}{I_{j,t}} \right]$:

$$\frac{1}{E[I_{j,t}]} \leq E\left[ \frac{1}{I_{j,t}} \right] \leq \frac{1}{E[I_{j,t}]} + \frac{Var(I_{j,t})}{E[I_{j,t}]^3}.$$
So we can bound the variance for any cluster $j$ in intervention arm $i$ by:

$$\frac{R_i^t}{m_1} \left\{ \left[ 1 + \frac{m_1 - 1}{n} \left( 1 + \frac{R_i^t}{k^t} \right) \right] \left[ \frac{1}{E[I_{j,t}]} \right] - R_i^t \right\}$$

$$\leq \text{Var} \left( \frac{Y_{j,t+1}}{m_1 I_{j,t}} \right)$$

$$\leq \frac{R_i^t}{m_1} \left\{ \left[ 1 + \frac{m_1 - 1}{n} \left( 1 + \frac{R_i^t}{k^t} \right) \right] \left[ \frac{1}{E[I_{j,t}]} + \frac{\text{Var}(I_{j,t})}{E[I_{j,t}]^3} \right] - R_i^t \right\}. \quad (3)$$

In fact, we will sample $m_0$ people in each cluster at time $t$ and can denote the number of individuals who test positive at time $t$ in cluster $j$ by $Y_{j,t}$. Again assuming $m_0$ is small relative to $n$, $Y_{j,t} \sim \text{Bin}(m_0, I_{j,t})$ and so $Y_{j,t}/m_0$ estimates $I_{j,t}$.

Conditional on $I_t$, $Y_{j,t}$ has expectation $m_1 I_{j,t}$ and variance $m_1 I_{j,t} (1 - I_{j,t})$. So the estimator $\frac{Y_{j,t+1}/m_1}{Y_{j,t}/m_0}$ approximately has expectation $R_i^t$ and has variance greater than that given above.
Appendix 2. Simulation Algorithms

**Algorithm 1:** Create Simulations For a Combination of Parameters

**Result:** List of simulations with and without intervention, $L_1, L_0$

Input $n, E[I_t], R_0, \Delta, k, I_0$

Initialize $L_\beta, L_d, L_0, L_1, P \leftarrow list()$

**Solve for transmission rate, $\beta$:**

for 1 to 2000 do

Create graph, $G$, overdispersed by $k$, size $n$

Initialize transmission rate, $b \leftarrow 0.04$

while $R_0$ of $G$ with $b \geq R_0$ do

말 $b \leftarrow b - 0.0001$

Add $b$ to $L_\beta$

$\beta \leftarrow \text{median}(L_\beta)$

**Solve for day of intervention, $t$:**

for 1 to 2000 do

Create graph, $G$, overdispersed by $k$, size $n$

Run simulation, $s$, for 200 days, transmission $\beta$, initial prevalence $I_0$

$I(d) \leftarrow$ prevalence of infectious persons, $I$, for each day, $d$, of $s$

Add $I(d)$ to $L_d$

$t \leftarrow \min d | I(d) \in L_d | I(d) \neq 0 \geq E[I_t] \text{ and } | I(d) \in L_d | \geq 200$

**Create 3000 simulations:**

for 1 to 3000 do

Create graph, $G$ overdispersed by $k$, size $n$

Run simulation until $t$, transmission $\beta$, initial prevalence $I_0$

Run simulation for one generation with transmission rate, $\beta$, and with transmission rate, $(1-\Delta) \times \beta$

Add simulation with transmission rate, $\beta$, and with transmission rate, $(1-\Delta) \times \beta$ to $L_0, L_1$, respectively

return $L_0, L_1$
Algorithm 2: Find Sufficient Number of Clusters Per Arm, $C_S$, for Two-Sample Welch’s t-test, One Generation after Intervention

Result: $C_S$ when $\alpha = 5\%$, power $\approx 80\%$

Input $L_0, L_1, m$

Initialize $P \leftarrow \text{list()}$

Initialize $C_{\text{min}} \leftarrow 1, C_{\text{max}} \leftarrow 1000$

**Binary Search**($L_1, L_0, C_{\text{min}}, C_{\text{max}}, m$):

$C \leftarrow \text{ceiling}(\frac{C_{\text{min}}+C_{\text{max}}}{2})$

for 1 to 10000 do

    Randomly choose $C$ clusters from $L_0$ and $C$ clusters from $L_1$

    Sample $m$ from each cluster at time of intervention, $t$

    $Y_t \leftarrow$ number of sampled infectious individuals at $t$

    Sample $m$ from each cluster one generation after intervention

    $Y_{t+1} \leftarrow$ number of sampled infectious individuals at $t + 1$

    Add p-value of two-sample Welch’s t-test of $\log((Y_{t+1} + 1)/(Y_t + 1))$ to $P$

Calculate power of $C$, $C_p \leftarrow$ proportion of $P$ with p-value $\leq 0.05$

if $C_{\text{max}} - C_{\text{min}} = 1$ or $C_p$ within $0.5\%$ of $80\%$ then

    return $C$

else

    if $C_p < 80\%$ then

        $C_{\text{max}} \leftarrow C$

    else

        $C_{\text{min}} \leftarrow C$

    **Binary Search**($L_1, L_0, C_{\text{min}}, C_{\text{max}}, m$)

Note: The binary search of Algorithm 2 is terminated if the power at first iteration (which tests 501 clusters per arm) is less than $40\%$ or if the power at second iteration (which tests 751 clusters per arm) is less than $60\%$. We assume that if either of these conditions are true, Algorithm 2 will not be able to solve for a sufficient number of clusters, $C_S$, $\leq 1000$. 

Stability of Simulation Algorithm

Solving for the required sample size first requires that we create a stable set of 3000 simulations for each parameter combination, which is done with Algorithm 1. We have assumed that the 3000 simulations capture the majority of the possibilities that a single recruited cluster could experience. More specifically, these 3000 simulations are assumed to account for variance in creation of the cluster’s contact network, as well as variance in the transmission of the epidemic through a given cluster’s contact network.

Algorithm 2, will return the first number of clusters it encounters within 0.5% of 80% (i.e. a window of 0.5%), or will return the result when the difference between the minimum and maximum clusters bounds of the recursive call is 1. For a given tested sample size, the power is assumed to have small variance. This may lead to a suboptimal sample size if (1) the window of 0.5% is too wide, leading the algorithm to return the first cluster size it encounters within this window when there is a smaller cluster size that also satisfies this window, or (2) if the window of 0.5% is too narrow compared to the variance in the power for a given sample size (i.e. the variance is not small), allowing for the possibility for Algorithm 2 to miss the optimal sample size stochastically. (2) will potentially lead to a solved for number of clusters that is outside of the 0.5% window. We assume the window of 0.5% is narrow enough to be stable against (1), and that the true relationship between sample size and power is approximately unique for the 0.5% window. We plot the distribution of power values for parameter sets (two-sample Welch’s t-test, one generation after sampling; one-sample t-test on differences when matching on susceptible individuals; one-sample t-test on differences when matching on non-infectious individuals) with solved number of clusters from Algorithm 2 in Figure S1 and find 105/108 parameter sets are within the 0.5% window of 80% power. Furthermore, for those 3 parameter sets outside the 0.5% window, the maximum difference from 80% is 0.27%. Both points show stability against (2).
Appendix 3. Supplementary Tables and Figures

Figure S1: **Distribution from stability analysis of algorithm 2.** Distribution of powers for parameter sets with solved number of clusters from Algorithm 2. Desired power was between 79.5% and 80.5%.

Figure S2: **The distribution of the number of infectious individuals per cluster at time of intervention has large variance.** (A) $n = 100$. (B) $n = 1000$. (C) $n = 10000$. 3000 simulations. $R_0 = 1.5$, $k = 0.7$, targeted $E[I_t] = 2\%$ for $n = 100$ and $E[I_t] = 0.5\%$ for $n = 1000, 10000$. This variance is accounted for in the simulations but not in the approximations.
Figure S3: Sensitivity analysis when the mean degree of a node (15 in main results) is roughly halved and doubled to 8 and 30, respectively. When cluster size is large ($n = 1000$ or 10000) and overdispersion is low ($k = 0.4$ or 0.7), halving and doubling average degree does not have a significant effect, except when effect size is low. When cluster size is large ($n = 1000$ or 10000) and overdispersion is high ($k = 0.1$) increasing the average degree usually lowers the sample size. When cluster size is small ($n = 100$) for some parameter combinations, there is a non-monotonic relationship between average degree and sample size, and for others there is a monotonic increase or decrease. Thus, there is increased sensitivity to the assumed mean degree for smaller cluster sizes. Parameter combinations with sample sizes greater than 1000 clusters per arm are excluded. Parameter combinations within each subplot that solely differ in the number of individuals sampled per cluster will have the same color and line type.
| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_t^C]$ | $\text{Var}[R_t^C]$ | $E[I_t]$ | $\text{Var}[I_t]$ | $E[R_{t+1}^C]$ | $\text{Var}[R_{t+1}^C]$ | $E[I_{t+1}]$ | $\text{Var}[I_{t+1}]$ | $m$ | $C_S$ |
|------|-----|-----|-------|--------|-------------|-------|-------------|--------|-------------|-------|-------------|----|------|
| 1.5  | 0.7 | 10  | 0.2   | 1.08   | 1.78        | 0.88  | 1.38        | 0.017  | 1.33E-04    | 0.018 | 4.71E-04    | 0.015 | 3.34E-04 |
| 0.4  | 1.09| 1.85| 0.72 | 0.92   | 1.28E-04   | 0.017 | 4.56E-04   | 0.012  | 2.40E-04    | 0.018 | 4.35E-04    | 0.015 | 3.35E-04 |
| 0.4  | 11  | 0.2 | 1.01 | 1.57   | 0.86       | 1.34  | 1.37E-04   | 0.017  | 3.35E-04    | 0.015 | 4.34E-04    | 0.012 | 2.64E-04 |
| 0.4  | 1   | 1.65| 0.67 | 0.84   | 1.43E-04   | 0.017 | 4.34E-04   | 0.012  | 2.64E-04    | 0.015 | 2.40E-04    | 0.012 | 1.64E-04 |
| 0.1  | 10  | 0.2 | 0.64 | 1.15   | 0.54       | 0.97  | 9.68E-05   | 0.011  | 2.74E-04    | 0.009 | 2.24E-04    | 0.01  | 1.64E-04 |
| 0.4  | 0.62| 1.08| 0.46 | 0.71   | 8.83E-05   | 0.014 | 2.64E-04   | 0.007  | 1.64E-04    | 0.01  | 8.33E-04    | 0.007 | 4.09E-04 |
| 2    | 0.7 | 8   | 0.2  | 1.49   | 2.96       | 1.23  | 2.16       | 0.017  | 7.85E-04    | 0.021 | 6.22E-04    | 0.01  | 4.09E-04 |
| 0.4  | 1.51| 3.23| 0.97 | 1.49   | 1.29E-04   | 0.026 | 8.33E-04   | 0.017  | 4.09E-04    | 0.01  | 1.78E-04    | 0.01  | 1.78E-04 |
| 0.4  | 8   | 0.2 | 1.32 | 2.76   | 1.11       | 1.87  | 1.35E-04   | 0.022  | 7.08E-04    | 0.019 | 4.95E-04    | 0.01  | 3.57E-04 |
| 0.4  | 1.33| 2.81| 0.86 | 1.46   | 1.24E-04   | 0.022 | 6.54E-04   | 0.014  | 3.57E-04    | 0.01  | 8.33E-04    | 0.01  | 4.09E-04 |
| 0.1  | 9   | 0.2 | 0.87 | 1.88   | 0.74       | 1.47  | 1.23E-04   | 0.015  | 4.45E-04    | 0.013 | 3.49E-04    | 0.01  | 2.65E-04 |
| 0.4  | 0.87| 1.96| 0.6  | 1.04   | 0.016     | 1.33E-04| 0.015 | 4.66E-04 | 0.01  | 2.65E-04    | 0.01  | 1.64E-04 |

Table S1: Full Simulation Results for $n = 100$, Two-Sample Welch’s t-test One Generation After Intervention. $R_0$ = target $R_0$. $k$ = overdispersion. $\Delta$ = % reduction in transmission. $t$ = day of intervention. $R_t^C = R_t$ without treatment. $R_t^T = R_t$ with treatment. $I_t$ = proportion of infectious persons at day of intervention. $I_{t+1}^C = $ proportion of infectious persons at time of sampling without treatment. $I_{t+1}^T = $ proportion of infectious persons at time of sampling with treatment. $m = $ number of persons sampled from each cluster. $C_S = $ number of clusters needed for each arm from simulations.
| $R_0$ | $k$  | $t$  | $\Delta$ | $E[R_t^C]$ | $\text{Var}[R_t^C]$ | $E[R_{t+1}^C]$ | $\text{Var}[R_{t+1}^C]$ | $E[I_t]$ | $\text{Var}[I_t]$ | $E[I_{t+1}]$ | $\text{Var}[I_{t+1}]$ | $m$  | $C_S$ |
|------|------|------|----------|------------|----------------------|----------------|------------------------|---------|------------------|-------------|------------------|------|------|
| 1.5  | 0.7  | 26   | 0.2      | 1.42       | 1.63                 | 1.2           | 1.06                   | 0.0049  | 1.92E-05         | 0.0065     | 4.04E-05         | 0.0054 | $\geq 1000$ |
| 0.4  | 1.46 | 1.83 | 0.97     | 0.85       | 0.0048              | 1.84E-05      | 0.0064                 | 1.92E-05| 0.0043           | 1.89E-05  | 0.0043           | 1.89E-05| 100 |
| 0.4  | 28   | 0.2  | 1.34     | 1.67       | 1.11                | 1.19          | 0.0046                 | 1.74E-05| 0.0056           | 2.96E-05  | 0.0046           | 2.15E-05| 100 |
| 0.4  | 1.42 | 1.92 | 0.91     | 0.78       | 0.0045              | 1.60E-05      | 0.0057                 | 2.96E-05| 0.0037           | 1.41E-05  | 100 |
| 0.1  | 43   | 0.2  | 1.1      | 0.94       | 0.82                | 0.005         | 1.39E-05               | 0.0047  | 1.42E-05         | 0.0041     | 1.15E-05         | 100 |
| 0.4  | 1.13 | 1.2  | 0.8      | 0.63       | 0.005               | 1.41E-05      | 0.0034                 | 8.73E-06| 100 |
| 2    | 0.7  | 17   | 0.2      | 2.02       | 2.86                | 1.63          | 2                     | 0.0051  | 2.11E-05         | 0.0097     | 8.40E-05         | 0.0078 | 100 |
| 0.4  | 2.08 | 3.2  | 1.28     | 1.39       | 0.0049              | 1.90E-05      | 0.0095                 | 7.94E-05| 0.0059           | 3.37E-05  | 100 |
| 0.4  | 1.96 | 3.24 | 1.56     | 2          | 0.0049              | 2.02E-05      | 0.0087                 | 6.59E-05| 0.007            | 4.49E-05  | 100 |
| 0.4  | 1.95 | 3.04 | 1.23     | 1.24       | 0.0049              | 2.15E-05      | 0.0087                 | 6.79E-05| 0.0056           | 3.12E-05  | 100 |
| 0.1  | 22   | 0.2  | 1.53     | 2.26       | 1.26                | 1.49          | 0.0043                 | 1.51E-05| 0.0061           | 3.13E-05  | 100 |
| 0.4  | 1.57 | 2.23 | 1        | 1.03       | 0.0045              | 1.62E-05      | 0.0064                 | 3.41E-05| 0.0042           | 1.70E-05  | 100 |

Table S2: **Full Simulation Results for $n = 1000$, Two-Sample Welch’s t-test One Generation After Intervention.** $R_0 =$ target $R_0$. $k =$ overdispersion. $\Delta =$ % reduction in transmission. $t =$ day of intervention. $R_t^C = R_t$ without treatment. $R_t^T = R_t$ with treatment. $I_t =$ proportion of infectious persons at day of intervention. $I_{t+1}^C = R_t$ without treatment. $I_{t+1}^T = R_t$ with treatment. $m =$ number of persons sampled from each cluster. $C_S =$ number of clusters needed for each arm from simulations.
### Table S3: Full Simulation Results for \( n = 10000 \), Two-Sample Welch's t-test One Generation After Intervention.

| \( R_0 \) | \( k \) | \( t \) | \( \Delta \) | \( E[R_t] \) | \( \text{Var}[R_t] \) | \( E[I_t] \) | \( \text{Var}[I_t] \) | \( I_t \) | \( \text{Var}[I_t] \) | \( m \) | \( C_S \) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | 0.7 | 50 | 0.2 | 1.35 | 0.15 | 1.13 | 0.005 | 7.72E-06 | 0.0046 | 5.13E-06 | 100 | ≥1000 |
| 0.4 | 0.4 | 1.18 | 0.16 | 0.82 | 0.08 | 0.005 | 0.0051 | 7.32E-06 | 0.0055 | 6.65E-06 | 100 | 486 |
| 2 | 0.4 | 3.08 | 0.19 | 0.19 | 0.08 | 0.002 | 0.005 | 5.49E-06 | 0.0135 | 1.91E-04 | 100 | 1000 |
| 0.4 | 0.4 | 1.92 | 0.35 | 0.3 | 0.18 | 0.003 | 0.002 | 5.52E-06 | 0.0033 | 2.08E-04 | 100 | 500 |
| 0.1 | 0.1 | 1.25 | 0.53 | 0.86 | 0.16 | 0.005 | 0.005 | 5.25E-06 | 0.0033 | 3.83E-04 | 100 | 1000 |

\( R_0 = \) target, \( k = \) overdispersion, \( \Delta = \% \) reduction in transmission, \( t = \) day of intervention, \( R_t^C = R_t \) without treatment, \( R_t^T = R_t \) with treatment, \( I_t = \) proportion of infectious persons at day of intervention, \( I_{t+1}^C = \) proportion of infectious persons at time of sampling without treatment, \( I_{t+1}^T = \) proportion of infectious persons at time of sampling with treatment, \( m = \) number of persons sampled from each cluster, \( C_S = \) number of clusters needed for each arm from simulations.
### Table S4: Full Simulation Results for \( n = 100 \), Two-Sample Welch’s t-test One Generation After Intervention, Day of Intervention \( t = 28 \). \( R_0 \) = target \( R_0 \). \( k \) = overdispersion. \( \Delta \) = % reduction in transmission. \( R_{Ct}^t \) = \( R_t \) without treatment. \( R_{Tt}^t \) = \( R_t \) with treatment. \( I_t \) = proportion of infectious persons at day of intervention. \( I_{Ct}^{t+1} \) = proportion of infectious persons at time of sampling without treatment. \( I_{Tt}^{t+1} \) = proportion of infectious persons at time of sampling with treatment. \( m \) = number of persons sampled from each cluster. \( C_S \) = number of clusters needed for each arm from simulations.
| $R_0$ | $k$ | $\Delta$ | $E[R_t]^{R_t}$ | $Var[R_t]$ | $E[R_t]$ | $Var[I_t]$ | $E[I_t]^{I_{t+1}}$ | $Var[I_{t+1}]$ | $E[I_{t+1}]^{I_{t+1}}$ | $Var[I_{t+1}]$ | $m$ | $C_S$ |
|-------|-----|---------|----------------|-----------|----------|------------|----------------|----------------|----------------|----------------|------|------|
| 1.5   | 0.7 | 0.2     | 1.45           | 1.63      | 1.19     | 1.15       | 0.0052        | 2.12E-05       | 0.0069         | 4.17E-05       | 0.0056 | 2.79E-05 | 100  | ≥1000 |
| 0.4   | 0.2 | 0.2     | 1.36           | 1.71      | 1.09     | 1.03       | 0.0046        | 1.67E-05       | 0.0057         | 2.96E-05       | 0.0046 | 2.03E-05 | 100  | ≥1000 |
| 0.4   | 0.2 | 0.2     | 1.41           | 1.76      | 0.94     | 0.77       | 0.0046        | 1.64E-05       | 0.0058         | 2.93E-05       | 0.004   | 1.52E-05 | 100  | ≥1000 |
| 0.1   | 0.2 | 0.2     | 1.22           | 1.51      | 1.01     | 1.13       | 0.0037        | 9.31E-06       | 0.0041         | 1.48E-05       | 0.0034 | 1.16E-05 | 100  | ≥1000 |
| 0.4   | 0.2 | 0.2     | 1.21           | 1.47      | 0.83     | 0.77       | 0.0037        | 9.62E-06       | 0.0041         | 1.54E-05       | 0.0028 | 8.09E-06 | 100  | ≥1000 |
| 2     | 0.7 | 0.2     | 1.98           | 2.11      | 1.6      | 1.52       | 0.0101        | 7.72E-05       | 0.0164         | 1.48E-04       | 0.0135 | 1.07E-04 | 100  | 470   |
| 0.4   | 0.2 | 0.2     | 1.93           | 2.2       | 1.23     | 0.87       | 0.0101        | 7.78E-05       | 0.0162         | 1.51E-04       | 0.0108 | 7.75E-05 | 100  | 123   |
| 0.4   | 0.2 | 0.2     | 1.78           | 2.06      | 1.45     | 1.3        | 0.0085        | 5.54E-05       | 0.0126         | 9.28E-05       | 0.0104 | 6.85E-05 | 100  | 642   |
| 0.4   | 0.2 | 0.2     | 1.78           | 1.98      | 1.15     | 0.88       | 0.0083        | 5.36E-05       | 0.0123         | 9.17E-05       | 0.0083 | 4.74E-05 | 100  | 169   |
| 0.1   | 0.2 | 0.2     | 1.55           | 1.7       | 1.28     | 1.3        | 0.0062        | 2.52E-05       | 0.0079         | 3.48E-05       | 0.0066 | 2.67E-05 | 100  | ≥1000 |
| 0.4   | 0.2 | 0.2     | 1.59           | 2.12      | 1.04     | 1         | 0.0061        | 2.54E-05       | 0.0078         | 3.50E-05       | 0.0053 | 1.94E-05 | 100  | 267   |

Table S5: Full Simulation Results for $n = 1000$, Two-Sample Welch’s t-test One Generation After Intervention, Day of Intervention $t = 28$. $R_0$ = target $R_0$. $k$ = overdispersion. $\Delta$ = % reduction in transmission. $R_t^{C_t}$ = $R_t$ without treatment. $R_t^T = R_t$ with treatment. $I_t$ = proportion of infectious persons at day of intervention. $I_{t+1}^{R_t}$ = proportion of infectious persons at time of sampling without treatment. $I_{t+1}^T$ = proportion of infectious persons at time of sampling with treatment. $m$ = number of persons sampled from each cluster. $C_S$ = number of clusters needed for each arm from simulations.
Table S6: Full Simulation Results for $n = 100$, Two-Sample Welch’s t-test Two Generations After Intervention. $R_0 = \text{target } R_0$, $k = \text{overdispersion}$. $\Delta = \% \text{ reduction in transmission}$. $t = \text{day of intervention}$. $R_{Ct}^T = R_t \text{ without treatment}$. $R_{Tt}^T = R_t \text{ with treatment}$. $I_t = \text{proportion of infectious persons at day of intervention}$. $I_{Ct+1}^T = R_t \text{ without treatment}$. $I_{Tt+1}^T = \text{proportion of infectious persons at time of sampling with treatment}$. $m = \text{number of persons sampled from each cluster}$. $C_S = \text{number of clusters needed for each arm from simulations}$. $C_S^C = \text{number of clusters needed from simulations using a two-sample Welch’s t-test in Table S1}$. 

| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_{Ct}^T]$ | $Var[R_{Ct}^T]$ | $E[R_{Tt}^T]$ | $Var[R_{Tt}^T]$ | $E[I_t]$ | $Var[I_t]$ | $E[I_{Ct+1}^T]$ | $Var[I_{Ct+1}^T]$ | $E[I_{Tt+1}^T]$ | $Var[I_{Tt+1}^T]$ | $m$ | $C_S$ | $C_S^C - C_S$ | 1 - $\frac{C_S^C}{C_S} \%$ |
|-------|-----|-----|----------|--------------|---------------|--------------|---------------|----------|-----------|--------------|---------------|--------------|---------------|-----|-----|---------------|------------------|
| 1.5   | 0.7 | 10  | 0.2      | 1.13         | 2.84          | 0.8          | 1.70          | 0.017    | 1.33E-04  | 0.018        | 5.45E-04      | 0.013         | 3.30E-04      | 10  | ≥ 1000 | -              | -                |
|       |     |     |          | 0.4         | 1.15          | 2.86         | 0.53          | 0.97     | 0.017     | 1.28E-04    | 0.018        | 5.40E-04      | 0.009         | 1.95E-04      | 10  | 439   | -              | -                |
|       |     |     |          | 0.4         | 11            | 0.2          | 0.96          | 0.24     | 0.69      | 1.37         | 0.016        | 4.36E-04      | 0.011         | 2.79E-04      | 10  | ≥ 1000 | -              | -                |
|       |     |     |          | 0.1         | 10            | 0.2          | 0.52          | 1.13     | 0.39      | 0.85         | 0.015        | 9.68E-05      | 0.008         | 2.05E-04      | 10  | 549   | -              | -                |
|       |     |     |          | 0.4         | 0.5           | 1.02         | 0.3           | 0.53     | 0.014     | 8.83E-05    | 0.007        | 1.75E-04      | 0.004         | 9.50E-05      | 10  | ≥ 1000 | -              | -                |
| 2     | 0.7 | 8   | 0.2      | 1.94         | 6.26          | 1.32         | 3.35          | 0.017    | 1.34E-04  | 0.03         | 1.09E-03      | 0.021         | 6.93E-04      | 10  | 767   | -              | -                |
|       |     |     |          | 0.4         | 1.83          | 5.46         | 0.89          | 1.96     | 0.017     | 1.29E-04    | 0.029        | 1.02E-03      | 0.014         | 3.92E-04      | 10  | 251   | 724            | 74.26            |
|       |     |     |          | 0.4         | 0.8           | 1.55         | 4.63          | 1.13     | 2.83      | 0.017       | 1.35E-04     | 0.024         | 8.17E-04      | 0.018 | 5.57E-04 | 10  | ≥ 1000 | -              | -                |
|       |     |     |          | 0.4         | 0.6           | 1.63         | 4.93          | 0.72     | 1.57      | 0.016       | 1.24E-04     | 0.025         | 8.63E-04      | 0.011 | 2.88E-04 | 10  | 251   | 594            | 60.39            |
|       |     |     |          | 0.1         | 9             | 0.2          | 0.76          | 1.95     | 0.63      | 1.56        | 0.016        | 1.23E-04     | 0.012         | 3.30E-04      | 0.01  | 2.56E-04 | 10  | ≥ 1000 | -              | -                |
|       |     |     |          | 0.4         | 0.7           | 1.75         | 1.87          | 0.44     | 0.86      | 0.016       | 1.33E-04     | 0.011         | 3.30E-04      | 0.007 | 1.57E-04 | 10  | ≥ 1000 | -              | -                |

Table S6: Full Simulation Results for $n = 100$, Two-Sample Welch’s t-test Two Generations After Intervention. $R_0 = \text{target } R_0$, $k = \text{overdispersion}$. $\Delta = \% \text{ reduction in transmission}$. $t = \text{day of intervention}$. $R_{Ct}^T = R_t \text{ without treatment}$. $R_{Tt}^T = R_t \text{ with treatment}$. $I_t = \text{proportion of infectious persons at day of intervention}$. $I_{Ct+1}^T = R_t \text{ without treatment}$. $I_{Tt+1}^T = \text{proportion of infectious persons at time of sampling with treatment}$. $m = \text{number of persons sampled from each cluster}$. $C_S = \text{number of clusters needed for each arm from simulations}$. $C_S^C = \text{number of clusters needed from simulations using a two-sample Welch’s t-test in Table S1}$.
**Table S7: Full Simulation Results for \( n = 1000 \), Two-Sample Welch’s t-test Two Generations After Intervention.**

\( R_0 \) = target \( R_0 \), \( k \) = overdispersion. \( \Delta \) = % reduction in transmission. \( t \) = day of intervention. \( R_t^C \) = \( R_t \) without treatment. \( R_t^T \) = \( R_t \) with treatment. \( I_t \) = proportion of infectious persons at day of intervention. \( I_{t+1}^C \) = proportion of infectious persons at time of sampling without treatment. \( I_{t+1}^T \) = proportion of infectious persons at time of sampling with treatment. \( m \) = number of persons sampled from each cluster. \( C_S \) = number of clusters needed for each arm from simulations. \( C_S^0 \) = number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S2.

| \( R_0 \) | \( k \) | \( t \) | \( \Delta \) | \( E[R_0^C] \) | \( Var[R_0^C] \) | \( E[R_0^T] \) | \( Var[R_0^T] \) | \( E[I_t] \) | \( Var[I_t] \) | \( E[I_{t+1}^C] \) | \( Var[I_{t+1}^C] \) | \( E[I_{t+1}^T] \) | \( Var[I_{t+1}^T] \) | \( m \) | \( C_S \) | \( C_S^0 \) | \( 1 - \frac{C_S}{C_S^0} \)% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | 0.7 | 26 | 0.2 | 1.84 | 4.64 | 1.26 | 2.1 | 0.0049 | 1.92E-05 | 0.0077 | 5.48E-05 | 0.0053 | 2.88E-05 | 100 | 318 | - | - |
| 0.4 | 1.84 | 4.33 | 0.8 | 1.1 | 0.0048 | 1.84E-05 | 0.0076 | 5.17E-05 | 0.0033 | 1.37E-05 | 100 | 85 | 245 | 74.24 |
| 0.4 | 28 | 0.2 | 1.62 | 3.8 | 1.12 | 2.25 | 0.0046 | 1.74E-05 | 0.0063 | 3.67E-05 | 0.0043 | 1.97E-05 | 100 | 376 | - | - |
| 0.4 | 1.72 | 3.9 | 0.7 | 0.9 | 0.0045 | 1.60E-05 | 0.0064 | 3.64E-05 | 0.0027 | 9.79E-06 | 100 | 95 | 250 | 72.46 |
| 0.1 | 43 | 0.2 | 1.05 | 1.76 | 0.73 | 0.93 | 0.005 | 1.39E-05 | 0.004 | 1.21E-05 | 0.0028 | 7.58E-06 | 100 | 814 | - | - |
| 0.4 | 1.08 | 2.05 | 0.5 | 0.63 | 0.005 | 1.41E-05 | 0.004 | 1.25E-05 | 0.0019 | 4.44E-06 | 100 | 228 | 430 | 65.35 |
| 2 | 0.7 | 17 | 0.2 | 3.62 | 13.44 | 2.31 | 6.06 | 0.0051 | 2.11E-05 | 0.0153 | 1.60E-04 | 0.01 | 8.20E-05 | 100 | 126 | 500 | 79.87 |
| 0.4 | 3.71 | 15.86 | 1.35 | 2.49 | 0.0049 | 1.90E-05 | 0.015 | 1.54E-04 | 0.0058 | 3.37E-05 | 100 | 33 | 125 | 79.11 |
| 0.4 | 19 | 0.2 | 3.23 | 12.77 | 2.07 | 5.65 | 0.0049 | 2.02E-05 | 0.0125 | 1.09E-04 | 0.0084 | 5.79E-05 | 100 | 174 | 593 | 77.31 |
| 0.4 | 3.16 | 11.62 | 1.24 | 2.63 | 0.0049 | 2.15E-05 | 0.0122 | 1.06E-04 | 0.0051 | 2.66E-05 | 100 | 47 | 150 | 76.14 |
| 0.1 | 22 | 0.2 | 2.06 | 6.61 | 1.38 | 2.92 | 0.0043 | 1.51E-05 | 0.007 | 3.69E-05 | 0.0049 | 2.13E-05 | 100 | 376 | - | - |
| 0.4 | 2.07 | 5.89 | 0.85 | 1.31 | 0.0045 | 1.62E-05 | 0.0072 | 3.65E-05 | 0.0033 | 1.15E-05 | 100 | 89 | 186 | 67.64 |

| 1000 | 91 | 208 | 69.57 |
| 1000 | 20 | 31 | 60.78 |
| 1000 | 90 | 130 | 59.09 |
| 1000 | 19 | 30 | 61.22 |
| 1000 | 111 | 203 | 64.65 |
| 1000 | 28 | 42 | 60.78 |
| 1000 | 58 | 100 | 63.29 |
| 1000 | 14 | 21 | 60.78 |
| 1000 | 70 | 125 | 60.67 |
| 1000 | 17 | 28 | 62.22 |
| 1000 | 105 | 186 | 63.92 |
| 1000 | 19 | 29 | 60.42 |
| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_t]$ | $Var[R_t]$ | $E[R_t]$ | $Var[R_t]$ | $E[I_t]$ | $Var[I_t]$ | $I_t^{C_{t+1}}$ | $Var[I_t^{C_{t+1}}]$ | $I_t^{T_{t+1}}$ | $Var[I_t^{T_{t+1}}]$ | $m$ | $C_S$ | $C_S^0 - C_S$ | $1 - \frac{C_S}{C_S^0}$ % |
|-------|-----|-----|---------|----------|-----------|----------|-----------|----------|-----------|----------------|----------------|-----------|----------------|-----|------|----------------|------------------|
| 1.5   | 0.7 | 50  | 0.2     | 1.72     | 0.53      | 1.13     | 0.22      | 0.005    | 7.72E-06  | 0.0077      | 1.21E-05      | 0.0052   | 6.28E-06  |       | 100  | 244        | -                |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 37   | 145        | 79.67            |
| 0.4   | 69  | 0.2 | 1.36    | 0.81     | 0.71      | 0.11     | 0.11      | 0.0051   | 7.83E-06  | 0.0078      | 1.18E-05      | 0.0033   | 2.89E-06  |       | 100  | 69         | 238              | 77.52        |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 10   | 30         | 75                 |
| 0.4   | 69  | 0.2 | 1.36    | 0.81     | 0.71      | 0.11     | 0.11      | 0.0051   | 7.83E-06  | 0.0078      | 1.18E-05      | 0.0033   | 2.89E-06  |       | 100  | 416        | -                | -              |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 37   | 145        | 79.67            |
| 0.4   | 69  | 0.2 | 1.36    | 0.81     | 0.71      | 0.11     | 0.11      | 0.0051   | 7.83E-06  | 0.0078      | 1.18E-05      | 0.0033   | 2.89E-06  |       | 100  | 69         | 238              | 77.52        |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 10   | 30         | 75                 |
| 0.7   | 24  | 0.2 | 3.69    | 1.16     | 2.35      | 0.53     | 0.53      | 0.0051   | 5.74E-06  | 0.0173      | 3.57E-05      | 0.0112   | 1.88E-05  |       | 100  | 86         | 415              | 82.83        |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 20   | 64         | 76.19            |
| 0.4   | 69  | 0.2 | 1.36    | 0.81     | 0.71      | 0.11     | 0.11      | 0.0051   | 7.83E-06  | 0.0078      | 1.18E-05      | 0.0033   | 2.89E-06  |       | 100  | 416        | -                | -              |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 37   | 145        | 79.67            |
| 0.4   | 69  | 0.2 | 1.36    | 0.81     | 0.71      | 0.11     | 0.11      | 0.0051   | 7.83E-06  | 0.0078      | 1.18E-05      | 0.0033   | 2.89E-06  |       | 100  | 69         | 238              | 77.52        |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 37   | 145        | 79.67            |
| 0.1   | 57  | 0.2 | 1.41    | 2.23     | 0.98      | 1.18     | 1.18      | 0.0045   | 5.24E-06  | 0.0044      | 2.84E-06      | 0.0031   | 1.61E-06  |       | 100  | 720        | -                | -              |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 37   | 145        | 79.67            |
| 0.4   | 1.44| 2.48| 0.63    | 0.26     | 0.0045    | 5.23E-06 | 0.0044   | 2.98E-06 | 0.0022   | 9.55E-07  | 0.0052       | 3.08E-06  | 0.0032   | 1.21E-05 | 100  | 189        | 360              | 65.57        |
|       |     |     |         |          |           |          |           |          |           |             |                |          |           | 1000 | 25   | 40         | 61.54            |

Table S8: **Full Simulation Results for $n = 10000$, Two-Sample Welch’s t-test Two Generations After Intervention.**

$R_0 = $ target $R_0$, $k = $ overdispersion. $\Delta = \%$ reduction in transmission. $t = $ day of intervention. $R_t^C = R_t$ without treatment. $R_t^T = R_t$ with treatment. $I_t = $ proportion of infectious persons at day of intervention. $I_t^{C_{t+1}} = $ proportion of infectious persons at time of sampling without treatment. $I_t^{T_{t+1}} = $ proportion of infectious persons at time of sampling with treatment. $m = $ number of persons sampled from each cluster. $C_S = $ number of clusters needed for each arm from simulations. $C_S^0 = $ number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S3.
| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_t^0]$ | $Var[R_t^0]$ | $E[I_t]$ | $Var[I_t]$ | $E[I_{t+1}^C]$ | $Var[I_{t+1}^C]$ | $E[I_{t+1}^T]$ | $Var[I_{t+1}^T]$ | $m$ | $C_S$ | $C_S^0 - C_S$ | $1 - \frac{C_S}{C_S^0}$, % |
|-------|-----|-----|--------|-----------|-------------|---------|----------|-------------|----------------|-------------|----------------|-----|------|----------------|------------------|
| 1.5   | 0.7 | 10  | 0.2    | 0.96      | 2.69        | 0.62   | 1.44     | 0.017       | 1.33E-04       | 0.014        | 4.40E-04       | 0.009 | 2.46E-04 | 10 ≥ 1000       | -                |
|       |     |     |        | 0.4      | 0.98        | 2.64   | 0.35     | 0.017       | 1.28E-04       | 0.015        | 4.25E-04       | 0.006 | 1.29E-04 | 10 ≥ 1000       | -                |
|       |     |     |        | 0.4     | 0.76        | 1.94   | 0.28     | 0.017       | 1.43E-04       | 0.012        | 3.37E-04       | 0.005 | 1.03E-04 | 10 ≥ 1000       | -                |
| 0.1   | 10  | 0.2 | 0.33   | 0.74      | 0.23        | 0.48   | 0.015    | 9.68E-05    | 0.005          | 1.15E-04      | 0.003          | 7.57E-05       | 10 ≥ 1000       | -                |
|       |     |     |        | 0.4     | 0.33        | 0.73   | 0.18     | 0.014       | 8.83E-05       | 0.005          | 1.06E-04       | 0.003          | 5.38E-05       | 10 ≥ 1000       | -                |
| 2     | 0.7 | 8   | 0.2    | 1.7      | 5.65        | 1.15   | 3.44     | 0.017       | 1.34E-04       | 0.025        | 8.33E-04       | 0.018          | 5.66E-04       | 10 ≥ 1000       | -                |
|       |     |     |        | 0.4     | 1.65        | 5.26   | 0.68     | 0.017       | 1.29E-04       | 0.025        | 8.31E-04       | 0.011          | 2.97E-04       | 10 ≥ 1000       | -                |
|       |     |     |        | 0.4     | 0.8        | 0.29   | 0.9      | 0.017       | 1.35E-04       | 0.019        | 5.84E-04       | 0.013          | 3.77E-04       | 10 ≥ 1000       | -                |
|       |     |     |        | 0.4     | 1.32        | 3.94   | 0.53     | 0.016       | 1.24E-04       | 0.019        | 5.90E-04       | 0.008          | 2.09E-04       | 10 ≥ 1000       | -                |
| 0.1   | 9   | 0.2 | 0.5    | 1.2      | 0.38        | 0.8    | 0.016    | 1.23E-04    | 0.007          | 1.77E-04      | 0.006          | 1.27E-04       | 10 ≥ 1000       | -                |
|       |     |     |        | 0.4     | 0.46        | 1.02   | 0.27     | 0.016       | 1.33E-04       | 0.007        | 1.58E-04       | 0.004          | 9.09E-05       | 10 ≥ 1000       | -                |

Table S9: Full Simulation Results for $n = 100$, Two-Sample Welch’s t-test Three Generations After Intervention. $R_0 = \text{target } R_0$, $k = \text{overdispersion}$, $\Delta = \% \text{ reduction in transmission}$, $t = \text{day of intervention}$, $R_t^C = R_t$ without treatment, $R_t^T = R_t$ with treatment, $I_t = \text{proportion of infectious persons at day of intervention}$, $I_{t+1}^C = R_t$ without treatment, $I_{t+1}^T = R_t$ with treatment, $m = \text{number of persons sampled from each cluster}$, $C_S = \text{number of clusters needed for each arm from simulations}$, $C_S^0 = \text{number of clusters needed for each arm from simulations using a two-sample Welch's t-test in Table S1}$.
| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_t^C]$ | Var[$R_t^C$] | $E[R_t^T]$ | Var[$R_t^T$] | $E[I_t]$ | Var[$I_t$] | $E[I_{t+1}^C]$ | Var[$I_{t+1}^C$] | $E[I_{t+1}^T]$ | Var[$I_{t+1}^T$] | $m$ | $C_S$ | $C_S^0 - C_S$ | $1 - \frac{C_S}{n}$, % |
|------|----|---|-----|--------|------------|--------|----------|--------|----------|--------|------------|----------|----------|----|------|----------------|------------------|
| 1.5  | 0.7| 26| 0.2 | 2.19   | 8.08      | 1.26   | 3.25     | 0.0049 | 1.92E-05 | 0.0083 | 5.93E-05   | 0.005     | 2.75E-05 | 100| 166 | -              | -                |
|      | 0.4| 22 | 8.83 | 0.61 | 1.07     | 0.0048 | 1.84E-05 | 0.0083 | 5.82E-05 | 0.0024 | 8.92E-06   | 0.005     | 100      | 124 | 81.61  | -              | -                |
|      | 0.4| 28 | 1.78 | 6.68 | 1.05     | 0.0046 | 1.74E-05 | 0.0062 | 3.80E-05 | 0.0037 | 1.59E-05   | 0.005     | 100      | 126 | 76.47  | -              | -                |
|      | 0.4| 19 | 7    | 0.52 | 0.86     | 0.0045 | 1.60E-05 | 0.0065 | 3.72E-05 | 0.0019 | 6.37E-06   | 0.005     | 100      | 157 | 71.36  | -              | -                |
|      | 0.1| 43 | 0.93 | 2.43 | 0.55     | 0.005  | 1.39E-05 | 0.0031 | 9.77E-06 | 0.0019 | 5.48E-06   | 0.005     | 100      | 775 | 65.35  | -              | -                |
|      | 0.4| 92 | 2.45 | 0.32 | 0.46     | 0.005  | 1.41E-05 | 0.003  | 4.00E-05 | 0.0011 | 2.61E-06   | 0.005     | 100      | 430 | 60.00  | -              | -                |
|      | 2.0| 17 | 0.2  | 5.32  | 35.06    | 2.84   | 11.19    | 0.0051 | 2.11E-05 | 0.0192 | 1.84E-04   | 0.0111    | 100      | 558 | 89.14  | 68.15           | 60.00           |
|      | 0.4| 5.34| 39.61| 1.34  | 3.31     | 0.0049 | 1.90E-05 | 0.0189 | 1.83E-04 | 0.0054 | 3.11E-05   | 0.005     | 100      | 139 | 87.97  | 75.32           | 71.43           |
|      | 0.4| 19 | 4.32 | 27.92 | 2.42     | 10.08  | 0.0049  | 2.02E-05 | 0.0142 | 1.09E-04 | 0.0086    | 5.51E-05 | 100   | 666 | 86.83  | 71.35           | 73.33           |
|      | 0.4| 22 | 2.21 | 9.21  | 1.4      | 4.37   | 0.0043  | 1.51E-05 | 0.0064 | 2.99E-05 | 0.0043    | 1.72E-05 | 100   | 314 | -     | 69.76           | 74.55           |
|      | 0.4| 22 | 9.82 | 0.68  | 1.45     | 0.0045 | 1.62E-05 | 0.0067 | 3.07E-05 | 0.0024 | 7.90E-06   | 0.005     | 100      | 205 | 74.55  | 66.67           | 66.67           |

Table S10: Full Simulation Results for $n = 1000$, Two-Sample Welch’s t-test Three Generations After Intervention. $R_0$ = target $R_0$, $k$ = overdispersion. $\Delta$ = % reduction in transmission. $t$ = day of intervention. $R_t^C = R_t$ without treatment. $R_t^T = R_t$ with treatment. $I_t = \text{proportion of infectious persons at day of intervention}$. $I_{t+1}^C = \text{proportion of infectious persons at time of sampling without treatment}$. $I_{t+1}^T = \text{proportion of infectious persons at time of sampling with treatment}$. $m = \text{number of persons sampled from each cluster}$. $C_S = \text{number of clusters needed for each arm from simulations}$. $C_S^0 = \text{number of clusters needed for each arm from simulations using a two-sample Welch's t-test in Table S2}$.
Table S11: Full Simulation Results for $n = 10000$, Two-Sample Welch’s t-test Three Generations After Intervention. $R_0 = \text{target } R_0$. $k = \text{overdispersion}$. $\Delta = \% \text{ reduction in transmission}$. $t = \text{day of intervention}$. $R_{Ct}^T = R_t$ without treatment. $R_{Tt}^T = R_t$ with treatment. $I_t = \text{proportion of infectious persons at day of intervention}$. $I_{Ct+1} = \text{proportion of infectious persons at time of sampling without treatment}$. $I_{Tt+1} = \text{proportion of infectious persons at time of sampling with treatment}$. $m = \text{number of persons sampled from each cluster}$. $C_S = \text{number of clusters needed for each arm from simulations}$. $C_S^0 = \text{number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S3}$. 

| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_{Ct}^T]$ | $Var[R_{Ct}^T]$ | $E[R_{Tt}^T]$ | $Var[R_{Tt}^T]$ | $E[I_t]$ | $Var[I_t]$ | $E[I_{Ct+1}^T]$ | $Var[I_{Ct+1}^T]$ | $E[I_{Tt+1}^T]$ | $Var[I_{Tt+1}^T]$ | $m$ | $C_S$ | $C_S^0 - C_S$ | $1 - \frac{m}{C_S}$ | $\%$ |
|-------|-----|-----|-----------|--------------|----------------|--------------|----------------|--------|----------|--------------|----------------|--------------|----------------|--------|-----|----------------|----------------|-----|
| 1.5   | 0.7 | 50  | 0.2       | 2.02         | 1.24          | 1.1          | 0.34          | 0.005  | 7.72E-06 | 0.0084       | 1.06E-05       | 0.0048       | 4.58E-06       | 100    | 120 | -              | -              | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 2.04| 1.58| 0.54      | 0.11         | 0.0051        | 7.83E-06      | 0.0085       | 1.03E-05 | 0.0024   | 1.48E-06     | 0.0031         | 1.94E-06     | 0.0017         | 7.29E-07 | 100 | 36  | 271            | 88.27          | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 69  | 0.2  | 1.45      | 0.82         | 0.0049        | 7.33E-06      | 0.0053       | 4.42E-06 | 0.0031   | 1.94E-06     | 0.0017         | 7.29E-07     | 0.0017         | 7.29E-07 | 100 | 244 | -              | -              | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 1.38| 1.11 | 0.41      | 0.14         | 0.005         | 7.32E-06      | 0.0052       | 4.39E-06 | 0.0017   | 7.29E-07     | 0.0017         | 7.29E-07     | 0.0017         | 7.29E-07 | 100 | 80  | 406            | 83.54          | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 2     | 0.7 | 24  | 0.53      | 5.2          | 2.95          | 1.38         | 0.0051       | 5.74E-06 | 0.0232   | 2.88E-05     | 0.0133         | 1.65E-05     | 0.0133         | 1.65E-05 | 100 | 41  | 460            | 91.82          | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 5.21| 4.34 | 1.36      | 0.25         | 0.0052        | 5.49E-06      | 0.0233       | 2.74E-05 | 0.0065   | 5.90E-06     | 0.0065         | 5.90E-06     | 0.0065         | 5.90E-06 | 100 | 11  | 115            | 91.27          | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 30  | 0.2  | 4.05      | 7.29         | 2.33          | 1.9          | 0.0052       | 8.55E-06 | 0.0158   | 1.59E-05     | 0.0096         | 9.51E-06     | 0.0096         | 9.51E-06 | 100 | 72  | 610            | 89.44          | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 4.1 | 7.02 | 1.14      | 0.49         | 0.0052        | 8.25E-06      | 0.0159       | 1.63E-05 | 0.0049   | 3.84E-06     | 0.0049         | 3.84E-06     | 0.0049         | 3.84E-06 | 100 | 19  | 146            | 88.48          | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 57  | 0.2  | 1.5       | 6.7          | 0.9           | 2.12         | 0.0045       | 5.24E-06 | 0.0036   | 2.37E-06     | 0.0023         | 1.29E-06     | 0.0023         | 1.29E-06 | 100 | 626 | -              | -              | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| 0.4   | 1.53| 6.04 | 0.45      | 0.36         | 0.0045        | 5.23E-06      | 0.0036       | 2.80E-06 | 0.0013   | 5.05E-07     | 0.0013         | 5.05E-07     | 0.0013         | 5.05E-07 | 100 | 162 | 387            | 70.49          | 100 |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
|       |     |     |           |              |               |              |              |        |          |              |               |              |               |        |     |                 |                 |     |
| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_t^0]$ | $\text{Var}[R_t^0]$ | $E[R_t]$ | $\text{Var}[R_t]$ | $E[I_t]$ | $\text{Var}[I_t]$ | $E[I_{t+1}^C]$ | $\text{Var}[I_{t+1}^C]$ | $E[I_{t+1}^T]$ | $\text{Var}[I_{t+1}^T]$ | $m$ | $C_S$ | $C_S^0 - C_S$ | $1 - \frac{C_S}{C_S^0}$, % |
|-------|-----|-----|---------|----------|----------------|--------|----------------|--------|----------------|----------|----------------|--------|----------------|-----|--------|----------------|-------------------|
| 1.5   | 0.7 | 0.2 | 1.08    | 1.78     | 0.88          | 1.38   | 0.017         | 1.33E-04| 0.018         | 4.71E-04 | 0.015         | 3.34E-04| 0.015         | 0.01 | 3088 | -          | - | 88.4    |
|       |     |     | 0.4     | 1.09     | 1.85          | 0.72   | 0.017         | 1.28E-04| 0.018         | 4.56E-04 | 0.012         | 2.40E-04| 0.012         | 0.01 | 50   | 31        | 3.39 |
|       |     |     | 0.4     | 11      | 0.2         | 1.01   | 0.86          | 1.34    | 0.018         | 4.35E-04 | 0.015         | 3.35E-04| 0.015         | 0.01 | 50   | 82        | 14.14 |
|       |     |     | 0.4     | 1       | 1.65         | 0.67   | 0.017         | 1.43E-04| 0.017         | 4.34E-04 | 0.012         | 2.64E-04| 0.012         | 0.01 | 50   | 14        | 9.86 |
|       |     |     | 0.1     | 10      | 0.2         | 0.64   | 0.54          | 0.97    | 0.015         | 9.68E-05| 0.011         | 2.74E-04| 0.009         | 0.01 | 50   | 234       | 26.71 |
|       |     |     | 0.4     | 0.62    | 1.08         | 0.46   | 0.014         | 8.83E-05| 0.011         | 2.64E-04| 0.007         | 1.64E-04| 0.007         | 0.01 | 50   | 123       | 15.11 |
|       |     |     | 2       | 0.7     | 0.2         | 1.49   | 2.96          | 2.16    | 0.017         | 1.34E-04| 0.025         | 7.85E-04| 0.021         | 6.22E-04| 0.021 | 50    | 29       | 2.97 |
|       |     |     | 0.4     | 1.51    | 3.23         | 0.97   | 1.49          | 0.017   | 1.29E-04     | 8.33E-04| 0.017         | 4.09E-04| 0.017         | 0.01 | 50   | 14        | 2.2  |
|       |     |     | 0.4     | 0.82    | 1.32         | 2.76   | 1.11          | 1.87    | 0.017         | 1.35E-04| 0.022         | 7.08E-04| 0.019         | 4.95E-04| 0.019 | 50   | 247      | 22.33 |
|       |     |     | 0.4     | 1.33    | 2.81         | 0.86   | 1.46          | 0.016   | 1.24E-04     | 6.54E-04| 0.014         | 3.57E-04| 0.014         | 0.01 | 50   | 185       | 27.45 |
|       |     |     | 0.1     | 9       | 0.2         | 0.87   | 1.88          | 0.74    | 0.016         | 1.23E-04| 0.015         | 4.45E-04| 0.013         | 3.49E-04| 0.013 | 50   | 94       | 11.12 |
|       |     |     | 0.4     | 0.87    | 1.96         | 0.6    | 1.04          | 0.016   | 1.33E-04     | 4.66E-04| 0.015         | 2.65E-04| 0.015         | 0.01 | 50   | 86        | 36.44 |

Table S12: Full Simulation Results for $n = 100$, One-Sample t-test With Matching On Sampled Susceptible Individuals. $R_0 = \text{target } R_0$. $k = \text{overdispersion}$. $\Delta = \% \text{ reduction in transmission}$. $t = \text{day of intervention}$. $R_t^C = R_t$ without treatment. $R_t^T = R_t$ with treatment. $I_t = \text{proportion of infectious persons at day of intervention}$. $I_{t+1}^C = \text{proportion of infectious persons at time of sampling without treatment}$. $I_{t+1}^T = \text{proportion of infectious persons at time of sampling with treatment}$. $m = \text{number of persons sampled from each cluster}$. $C_S = \text{number of clusters needed for each arm from simulations}$. $C_S^0 = \text{number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S1}$.
Table S13: Full Simulation Results for \( n = 1000 \), One-Sample t-test With Matching On Sampled Susceptible Individuals. \( R_0 \) = target \( R_0 \). \( k \) = overdispersion. \( \Delta \) = % reduction in transmission. \( t \) = day of intervention. \( R_t^{C} \) = \( R_t \) without treatment. \( R_t^{T} \) = \( R_t \) with treatment. \( I_t \) = proportion of infectious persons at day of intervention. \( I_t^{C} \) = proportion of infectious persons at time of sampling without treatment. \( I_t^{T} \) = proportion of infectious persons at time of sampling with treatment. \( m \) = number of persons sampled from each cluster. \( C_S \) = number of clusters needed for each arm from simulations. \( C_S^0 \) = number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S2.
| $R_0$ | $k$ | $t$ | $\Delta$ | $E[R_0]$ | $\text{Var}[R_0]$ | $E[I_t]$ | $\text{Var}[I_t]$ | $E[I_{t+1}^C]$ | $\text{Var}[I_{t+1}^C]$ | $E[I_{t+1}^T]$ | $\text{Var}[I_{t+1}^T]$ | $m$ | $C_S$ | $C_S^S - C_S$ | $1 - \frac{C_S^S}{C_S}$, % |
|------|-----|-----|---------|---------|----------------|---------|----------------|---------|----------------|---------|----------------|-----|-----|---------------|-------------------|
| 1.5  | 0.7 | 50  | 0.2     | 1.35    | 0.15          | 1.13    | 0.1           | 0.005   | 7.72E-06       | 0.0065  | 1.10E-05       | 0.0054 | 7.80E-06 | 100 ≥ 1000 | -               |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 182 | 0 | 0 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 40 | 0 | 0 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 213 | 7 | 3.18 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 55 | 1 | 1.79 |       |
| 2    | 0.7 | 24  | 0.2     | 2.08    | 0.2          | 1.66    | 0.14         | 0.0051  | 5.74E-06       | 0.0103  | 2.02E-05       | 0.0082 | 1.36E-05 | 100 486 | 15 | 2.99 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 84 | 0 | 0 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 21 | -1 | -5 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 113 | -1 | -0.89 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 164 | 1 | 0.61 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 27 | -1 | -3.85 |       |
| 0.1  | 0.7 | 57  | 0.2     | 1.25    | 0.51         | 1.05    | 0.33         | 0.0045  | 5.24E-06       | 0.0048  | 3.76E-06       | 0.0041 | 2.95E-06 | 100 ≥ 1000 | -               |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 244 | 35 | 12.54 |       |
|      |     |     |         |         |               |         |              |         |                 |         |               |       |       | 1000 59 | 6 | 9.23 |       |
| 0.4  | 1.27| 53  | 0.86    | 0.045   | 5.23E-06     | 0.074   | 1.08         | 0.0033  | 1.10E-06       | 0.0030  | 2.56E-06       | 0.0030 | 1.00E-05 | 100 533 | 16 | 2.91 |       |

Table S14: Full Simulation Results for $n = 10000$, One-Sample t-test With Matching On Sampled Susceptible Individuals. $R_0 =$ target $R_0$. $k =$ overdispersion. $\Delta =$ % reduction in transmission. $t =$ day of intervention. $R_{t}^C = R_t$ without treatment. $R_{t}^T = R_t$ with treatment. $I_t =$ proportion of infectious persons at day of intervention. $I_{t+1}^C =$ proportion of infectious persons at time of sampling without treatment. $I_{t+1}^T =$ proportion of infectious persons at time of sampling with treatment. $m =$ number of persons sampled from each cluster. $C_S =$ number of clusters needed for each arm from simulations. $C_S^C =$ number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S3.
Table S15: Full Simulation Results for $n = 100$, One-Sample t-test With Matching On Sampled Non-Infectious Individuals. $R_0$ = target $R_0$. $k$ = overdispersion. $\Delta$ = % reduction in transmission. $t$ = day of intervention. $R^C_t = R_t$ without treatment. $R^T_t = R_t$ with treatment. $I_t$ = proportion of infectious persons at day of intervention. $I^C_{t+1}$ = proportion of infectious persons at time of sampling without treatment. $I^T_{t+1}$ = proportion of infectious persons at time of sampling with treatment. $m$ = number of persons sampled from each cluster. $C_S$ = number of clusters needed for each arm from simulations. $C^M_S$ = number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S1. $C^D_S$ = number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S12.
Table S16: Full Simulation Results for \( n = 1000 \), One-Sample t-test With Matching On Sampled Non-Infectious Individuals. \( R_0 \) = target \( R_0 \). \( k \) = overdispersion. \( \Delta \) = % reduction in transmission. \( t \) = day of intervention. \( R_t^C \) = \( R_t \) without treatment. \( R_t^{C} \) = \( R_t \) with treatment. \( I_t \) = proportion of infectious persons at day of intervention. \( I_{t+1}^C \) = proportion of infectious persons at time of sampling without treatment. \( I_{t+1}^{C} \) = proportion of infectious persons at time of sampling with treatment. \( m \) = number of persons sampled from each cluster. \( C_S \) = number of clusters needed for each arm from simulations. \( C^{S}_S \) = number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S2. \( C^{M}_S \) = number of clusters needed for each arm from simulations using a two-sample Welch’s t-test in Table S13.

| \( R_0 \) | \( k \) | \( t \) | \( \Delta \) | \( E[R_t^C] \) | \( Var[R_t^C] \) | \( E[I_t] \) | \( Var[I_t] \) | \( E[I_{t+1}^C] \) | \( Var[I_{t+1}^C] \) | \( E[I_{t+1}^{C}] \) | \( Var[I_{t+1}^{C}] \) | \( m \) | \( C_S \) | \( C^{S}_S \) | \( 1 - \frac{C^{M}_S}{C_S}, \% \) | \( 1 - \frac{C^{S}_S}{C_S}, \% \) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | 0 | 26 | 0.2 | 1.12 | 1.63 | 1.2 | 1.06 | 0.0049 | 1.92E-05 | 0.0065 | 4.04E-05 | 0.0054 | 2.82E-05 | 0.0076 | 0 | 0 |
| 0.4 | 0.7 | 26 | 0.2 | 1.46 | 1.83 | 0.97 | 0.85 | 0.0048 | 1.84E-05 | 0.0064 | 3.66E-05 | 0.0043 | 1.89E-05 | 0.0077 | 0 | 0 |
| 0.4 | 28 | 0.2 | 1.34 | 1.67 | 1.11 | 1.19 | 0.0046 | 1.74E-05 | 0.0056 | 2.90E-05 | 0.0046 | 2.15E-05 | 0.0077 | 0 | 0 |
| 0.4 | 43 | 0.2 | 1.1 | 1 | 0.94 | 0.82 | 0.005 | 1.39E-05 | 0.0047 | 1.42E-05 | 0.0041 | 1.15E-05 | 0.0076 | 0 | 0 |
| 0.7 | 17 | 0 | 2.02 | 2.86 | 1.63 | 2.1 | 0.0051 | 2.11E-05 | 0.0097 | 8.40E-05 | 0.0078 | 5.65E-05 | 0.0094 | 0 | 0 |
| 0.4 | 2.08 | 3.2 | 1.28 | 1.39 | 0.0049 | 1.90E-05 | 0.0059 | 7.91E-05 | 0.0059 | 3.37E-05 | 0.0072 | 2.21E-05 | 0.0073 | 0 | 0 |
| 0.4 | 19 | 0.2 | 1.96 | 3.24 | 1.56 | 2 | 0.0049 | 2.02E-05 | 0.0087 | 6.59E-05 | 0.0067 | 4.49E-05 | 0.0074 | 0 | 0 |
| 0.4 | 19 | 0.2 | 1.95 | 3.04 | 1.23 | 1.24 | 0.0049 | 2.15E-05 | 0.0087 | 6.79E-05 | 0.0056 | 3.12E-05 | 0.0073 | 0 | 0 |
| 0.1 | 22 | 0.2 | 1.53 | 2.26 | 1.26 | 1.49 | 0.0043 | 1.51E-05 | 0.0061 | 3.13E-05 | 0.005 | 2.27E-05 | 0.0068 | 0 | 0 |
| 0.4 | 1.57 | 2.23 | 1 | 1.03 | 0.0045 | 1.62E-05 | 0.0064 | 3.41E-05 | 0.0042 | 1.70E-05 | 0.0054 | 2.82E-05 | 0.0076 | 0 | 0 |
### Table S17: Full Simulation Results for \( n = 10000 \), One-Sample t-test With Matching On Sampled Non-Infectious Individuals.

| \( R_0 \) | \( k \) | \( t \) | \( \Delta \) | \( E[R_t] \) | \( Var[R_t] \) | \( E[I_t] \) | \( Var[I_t] \) | \( E[R_{t+1}] \) | \( Var[R_{t+1}] \) | \( E[I_{t+1}] \) | \( Var[I_{t+1}] \) | \( m \) | \( C_S \) | \( C_S^M \) | \( 1 - \frac{C_S}{C_S^M} \) | \( 1 - \frac{C_S}{C_S^M} \) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | 0.7 | 50 | 0.2 | 1.35 | 0.15 | 1.13 | 0.1 | 0.005 | 7.72E-06 | 0.0005 | 1.10E-05 | 0.00054 | 7.80E-06 | 100 | 783 | - | - | - |
| 0.4 | 1.37 | 0.22 | 0.92 | 0.09 | 0.0051 | 7.83E-06 | 0.0066 | 1.00E-05 | 0.0044 | 5.45E-06 | 100 | 189 | 114 | 38.44 | 37.62 |
| 0.4 | 60 | 0.2 | 1.2 | 0.22 | 1.01 | 0.15 | 0.0049 | 7.33E-06 | 0.0054 | 6.84E-06 | 0.0046 | 5.13E-06 | 100 | 999 | - | - | - |
| 0.4 | 1.18 | 0.16 | 0.82 | 0.08 | 0.005 | 7.32E-06 | 0.0055 | 6.65E-06 | 0.0039 | 3.65E-06 | 100 | 271 | 199 | 44.24 | 42.34 |
| 2 | 0.7 | 24 | 0.2 | 2.08 | 0.2 | 1.66 | 0.14 | 0.0051 | 5.74E-06 | 0.0103 | 2.02E-05 | 0.0082 | 1.36E-05 | 100 | 330 | 156 | 34.13 | 32.1 |
| 0.4 | 2.08 | 0.19 | 1.28 | 0.08 | 0.0052 | 5.49E-06 | 0.0105 | 1.91E-05 | 0.0065 | 8.40E-06 | 100 | 86 | 40 | 31.75 | 31.75 |
| 0.4 | 30 | 0.2 | 1.92 | 0.31 | 1.55 | 0.2 | 0.0052 | 8.55E-06 | 0.0094 | 2.08E-05 | 0.0077 | 1.45E-05 | 100 | 455 | 203 | 33.28 | 30.85 |
| 0.4 | 1.92 | 0.3 | 1.23 | 0.19 | 0.0052 | 8.25E-06 | 0.0093 | 1.99E-05 | 0.006 | 9.29E-06 | 100 | 113 | 51 | 31.52 | 31.1 |
| 0.1 | 57 | 0.2 | 1.25 | 0.51 | 1.05 | 0.33 | 0.0045 | 5.24E-06 | 0.0048 | 3.76E-06 | 0.0041 | 2.95E-06 | 100 | 100 | ≥1000 | - | - |
| 0.4 | 1.27 | 0.53 | 0.86 | 0.16 | 0.0045 | 5.23E-06 | 0.0048 | 3.83E-06 | 0.0034 | 2.29E-06 | 100 | 304 | 229 | 44.63 | 42.96 |
| 1000 | 186 | 58 | 33.33 | 23.77 |
| 1000 | 45 | 14 | 30.77 | 23.73 |