

Supplemental text for:

Model-based assessment of COVID-19 transmission dynamics within partially vaccinated school populations during an in-person fall 2021 semester

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Data and code for this analysis can be found at <https://github.com/jrhead/COVIDandVaccinatedSchools>

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Table S1. Parameters of the susceptible-exposed-infected-recovered model

Parameter	Ages (i)	Values	References
Basic reproduction number, R_0	all	5.0 – Delta variant 2.5 – Alpha variant	CDC [1]
Proportion of infections attributable to Delta variant	all	84%	CDPH [2]
Average incubation period, d_L (95% CI)	all	5.4 (2.4, 8.3)	Guan, et al[3] Li, et al[4] Lauer, et al[5]
Average duration of infection, non-hospitalized individuals, d_I (95% CI)	all	7.5 (4.7, 9.6)	Ma, et al [6] Byrne, et al [7]
Average time from infection to hospitalization, d_H (95% CI)	all	7.2 (4.6, 9.4)	Li, et al [8] Moghadas, et al [9] Arentz, et al [10] Shoukat, et al [11]
Average duration of hospitalization, individuals who recover, d_R , or die, d_M (95% CI)	all	14.4 (11.3, 16.6)	Lewnard, et al[12] Ferguson, et al[13]
Probability case is clinical, $\Pr(\text{symptoms} \mid \text{age, infection})$	$i < 20$ $i \geq 20$	0.21 0.69	Davies, et al[14] Garcia, et al [15]
Probability infection is acquired from subclinical transmission, α	all	0.50	Byambasuren, et al [16]
Probability of hospitalization among clinical cases, $\Pr(\text{hospital} \mid \text{age, symptoms})$	$i < 10$ $10 \leq i < 20$ $20 \leq i < 30$ $30 \leq i < 40$ $40 \leq i < 50$ $50 \leq i < 60$ $60 \leq i < 70$ $70 \leq i < 80$ $i \geq 80$	0.00001 0.000408 0.0104 0.0343 0.0425 0.0816 0.118 0.166 0.184	Verity, et al[17]
Probability of death among hospitalized patients, $\Pr(\text{death} \mid \text{age, hospital})$	$i < 20$ $20 \leq i < 30$ $30 \leq i < 40$ $40 \leq i < 50$ $50 \leq i < 60$ $60 \leq i < 70$ $70 \leq i < 80$ $i \geq 80$	0.02 0.031 0.0475 0.0785 0.1215 0.186 0.301 0.4515	Lewnard, et al[12]
Ratio of susceptibility among adults to susceptibility among children, $\beta_{i < 10} / \beta_{i \geq 10}$	all	0.50	Viner, et al[18]
Vaccination coverage	$i \geq 12$	50 – 95%	CDC Data Tracker [19]
Vaccine effectiveness against:			
- any infection	$i \geq 12$	77%	Higdon, et al [20]
- symptomatic infection	$i \geq 12$	85%	Bernal, et al [21]
- severe infection (requiring hospitalization)	$i \geq 12$	93%	Self, et al [22]

Transmission model details

We developed a discrete-time, age-structured individual-based stochastic model to simulate COVID-19 transmission dynamics in the synthetic population (Figure 1A). At each point in time, representative of one day, each individual is associated with an epidemiological state: vaccinated (V), susceptible (S), exposed (E), asymptomatic (A), symptomatic with non-severe illness (C), symptomatic with severe illness (H1, D1) resulting in eventual hospitalization before recovery (H2) or hospitalization before death (D2), recovered (R), or dead (M). Model parameters are in Table S1.

The daily contact rate between individuals i and j on day t , $K_{ij,t}$, was estimated for pairs of individuals,

$$K_{ij,t} = \begin{cases} 1 & \text{for household interaction} \\ 5/7 \cdot \rho_{sch}(x_i, x_j, t) \cdot \rho_{int}(x_i, x_j, t) & \text{for class interaction} \\ 1/7 \cdot \rho_{sch}(x_i, x_j, t) \cdot \rho_{int}(x_i, x_j, t) & \text{for grade interaction} \\ 1/35 \cdot \rho_{sch}(x_i, x_j, t) \cdot \rho_{int}(x_i, x_j, t) & \text{for school interaction} \\ 5/7 \cdot \rho_{wrk}(x_i, x_j, t) \cdot \rho_{int}(x_i, x_j, t) & \text{for workplace interaction} \\ K(\text{age}_i, \text{age}_j)/N(\text{age}_j) \cdot \rho_{com}(x_i, x_j, t) & \text{for community interaction} \end{cases}$$

where the scaling ratios between classes, grades, and schools were obtained from previous study on transmission in various settings.[23] Community interaction represents the number of contacts expected between individuals from age groups of individuals i and j scaled by the number of individuals in the age group of individual j . $\rho_{int}(x_i, x_j, t)$ is a factor between 0 and 1 representing a social distancing intervention to reduce contact between individual pairs, and is equal to one under a no-intervention scenario. Because symptomatic individuals mix less with the community[24], we simulated a 100% reduction in daily school or work contacts and a 75% reduction in community contacts for a proportion (48%) of symptomatic individuals, and an additional proportion (50%) of their household members.[25] For these individuals, $\rho_{sch}(x_i, x_j, t)$ and $\rho_{wrk}(x_i, x_j, t)$ is equal to 0 and $\rho_{com}(x_i, x_j, t)$ is equal to 0.25, if: 1) either individual i or j is symptomatic (C, H1, or D1) on day t and isolates with some probability, or 2) either individual i or j is a household member of a symptomatic individual on day t and quarantines with some probability; and otherwise equal to 1. We assumed that individuals were in the infectious class for up to 3 days prior to observing symptoms[26], during which time they did not reduce their daily contacts.

Transmission was implemented probabilistically for contacts between susceptible (S) and infectious individuals in the asymptomatic (A) or symptomatic and non-hospitalized states (C, H1, D1). Movement of individual i on day t from the susceptible to the exposed class is determined by a Bernoulli random draw with probability of infection per day given by the daily force of infection, $\lambda_{i,t}$:

$$\lambda_{i \in S, t} = \alpha \beta_i \sum_{j=1}^N K_{ij,t} A_{j,t} + \beta_i \sum_{j=1}^N K_{ij,t} (C_{j,t} + H1_{j,t} + D1_{j,t}) \quad (1)$$

Movement of an individual i on day t from the vaccinated to the exposed class was determined by a Bernoulli random draw with probability of infection per day given by the daily force of infection, $\lambda_{i,t}$, reduced by the vaccine effectiveness against any infection:

$$\lambda_{i \in V, t} = (1 - VE_{any\ infection}) \lambda_{i \in S, t} \quad (2)$$

In equations (1) and (2), α is the ratio of the force of infection between asymptomatic and symptomatic individuals; and β_i is calculated from $\bar{\beta}$, the population mean transmission rate of the pathogen. $\bar{\beta}$ is determined using the next-generation matrix method[27] as:

$$\bar{\beta} = \frac{R_0}{[d_I(p_C + \alpha p_A) + d_H(p_H + p_D)] \bar{K}} \quad (3)$$

where R_0 is the basic reproduction number (defined as the expected number of secondary cases from a single infected case in a completely susceptible population); p_s is the proportion of agents destined for state s ; d_I is the average time between infection and recovery for tracks A and C; d_H is the average time between infection and hospitalization for tracks H and D; and \bar{K} is the mean number of contacts an individual makes daily under no interventions, weighted by their probability of being contacted.[28] Here, we calculated R_0 as 4.6, based on an average of R_0 for the Alpha ($R_0 = 2.5$ and proportion = 16%) and Delta variant ($R_0 = 5.0$ and proportion = 84%), weighted by the proportion of circulating variants in summer 2021 [1, 2]. We represent age-varying susceptibility[14] using an age-stratified β_i that incorporates the ratio of the susceptibility of adults to children and jointly solves equations (4) and (5):

$$\bar{\beta} = \beta_{i \geq age} \frac{n_{i \geq age}}{N} + \beta_{i < age} \frac{n_{i < age}}{N} \quad (4)$$

$$\beta_{i \geq age} = \beta_{i < age} \left(\frac{\text{Susceptibility of adults}}{\text{Susceptibility of children}} \right) \quad (5)$$

The duration of the latent period, d_L , for each individual transitioning from class E was drawn from a Weibull distribution with mean 5.4 days (95% CI: 2.4, 8.3).[3-5] Whether an individual remained asymptomatic, or was hospitalized, or died was determined via Bernoulli random draws from age-stratified conditional probabilities (Figure 1B, Table S5). The time to recovery for non-hospitalized cases (mean: 13.1 days, 95% CI: 8.3, 16.9)[29], the time to hospitalization for severe cases (mean: 10.3, 95% CI: 6.5, 13.3)[30], and time to recovery or death for hospitalized cases (mean: 14.4, 95% CI: 11.3, 16.6) were sampled from Weibull distributions (Table S5) [12].

The disease progression track followed by each individual after movement to the exposed state was assigned from Bernoulli random draws at the start of each simulation. Tracks for unvaccinated individuals were sampled from distributions specified by the age-stratified conditional probabilities, given in Table S1. Tracks for vaccinated individuals were sampled from distributions specified by the age-stratified conditional probabilities given, accounting for differential vaccine effectiveness against symptomatic and severe disease. The probability of death is conditional on hospitalization, so conditioning the probability of hospitalization on vaccination status also conditions the probability of death on vaccination status. Specifically, the probability of success for symptomatic and severe (e.g., requiring hospitalization) disease was updated as follows:

$$P(\text{symptoms} | \text{age}, \text{infection}, \text{vaccination}) = P(\text{symptoms} | \text{age}, \text{infection}) * \frac{(1 - VE_{\text{symptomatic}})}{(1 - VE_{\text{any infection}})} \quad (6)$$

$$P(\text{hospital} | \text{age}, \text{symptoms}, \text{vaccination}) = P(\text{hospital} | \text{age}, \text{symptoms}) * \frac{(1 - VE_{\text{severe}})}{(1 - VE_{\text{symptomatic}})} \quad (7)$$

Description of reopening strategies

1. Schools open without precautions

In this scenario, schools are open under a business-as-usual scenario. For all interactions, $\rho_{int}(x_i, x_j, t) = 1$. The average class size is 20 students, the average sizes of elementary (K - 5), middle (6-8), and high schools (9-12) are 380, 420, and 620 students.

2. Students and faculty wear masks

In this scenario, we assume that both students and teachers wear masks while at school. We assume that the masks both reduce the likelihood of acquiring COVID-19, as well as the likelihood of transmitting it. We assume that the effectiveness of masks for elementary school children is 15%, the effectiveness for middle school children is 25%, the effectiveness for high school children is 35% and the effectiveness for teachers is 50%. Accordingly, for each school, grade, or class pair, we have:

$$\rho_{int}(x_i, x_j, t) = (1 - \eta(x_i)) \cdot (1 - \eta(x_j)),$$

where $\eta(x_i)$ represents the effectiveness of the mask for individual i . such that $\eta(x_i) = 0.15$ if the individual is an elementary school student, $\eta(x_i) = 0.25$ if the individual is a middle school student, $\eta(x_i) = 0.35$ if the individual is a high school student, and $\eta(x_i) = 0.5$ if the individual is a teacher or staff member.

3. Stable cohorts: classroom groups are enforced, reducing other grade and school contacts by 75%

In this scenario, we assume that students reduce their contacts with other teachers and students outside of their class group (or cohort) by a given proportion. We model both reductions of outside-class contacts by 50% (“weak” cohort approach) or 75% (“strong” cohort approach). The size of the class group is 20 students, on average. This may be equivalent to reductions in lunchroom or recess contacts, while still permitting chance interactions in the hallways or bathrooms. Here, we update $\rho_{int}(x_i, x_j, t)$ such that:

$$\rho_{int}(x_i, x_j, t) = \begin{cases} 1 & \text{for class interaction} \\ 0.25 & \text{for grade interaction} \\ 0.25 & \text{for school interaction} \end{cases}$$

4. Weekly testing of teachers and students (periodic test-trace-isolate, TTI): Faculty and students are tested with 85% sensitivity on a weekly or monthly basis⁴², and positive cases are isolated and their class quarantined for 14 days

In this scenario, every 7 or 30 days, the state of the non-hospitalized agents are ascertained through a simulated test. We assumed that the test would detect individuals in a symptomatic or asymptomatic or pre-symptomatic state with 85% sensitivity and 100% specificity. If a truly positive case was simulated to test positive, the case would reduce their school contacts by 100% for 14 days and their community contacts by 75% for 14 days. Additionally, the students or teacher in the same class as the case would reduce their school contacts by 100% and their community contacts by 75% for 14 days. This is implemented though updating $\rho_{sch}(x_i, x_j, t)$ and $\rho_{comm}(x_i, x_j, t)$ as described. If a school administrator tested positive, only the administrator isolated for 14 days.

Supplemental results for modelling scenarios from the main text

Table S2. The number of excess student cases attributable to school transmission expected across a four-month semester, for 50% community vaccination coverage. Other modelling parameters are given in Table S1.

	Excess student cases attributable to within-school transmission within:			
	380-person elementary schools <i>(half susceptibility)</i>	380-person elementary schools <i>(equal susceptibility)</i>	420-person middle schools	620-person high schools
No precautions	45 cases per school	59 cases per school	55 cases per school	81 cases per school
Masks	22 cases per school	44 cases per school	31 cases per school	35 cases per school
Masks + testing	15 cases per school	38 cases per school	24 cases per school	24 cases per school
Masks + cohorts	4 cases per school	15 cases per school	6 cases per school	6 cases per school

Table S3. The number of excess student cases attributable to school transmission expected across a four-month semester, for 60% community vaccination coverage. Other modelling parameters are given in Table S1.

	Excess student cases attributable to within-school transmission within:			
	380-person elementary schools <i>(half susceptibility)</i>	380-person elementary schools <i>(equal susceptibility)</i>	420-person middle schools	620-person high schools
No precautions	40 cases per school	56 cases per school	49 cases per school	70 cases per school
Masks	17 cases per school	40 cases per school	24 cases per school	21 cases per school
Masks + testing	10 cases per school	33 cases per school	16 cases per school	13 cases per school
Masks + cohorts	3 cases per school	12 cases per school	4 cases per school	3 cases per school

Table S4. The minimum non-pharmaceutical intervention needed to reduce the risk of symptomatic infection to beneath a given threshold (e.g., 50 cases per 1,000 population), assuming that 50% of the vaccine-eligible community has received a vaccine. Other modelling parameters are given in Table S1. ‘Not observed’ indicates that no combination of interventions examined in this study reduced excess risk beneath the indicated threshold.

		Threshold - symptomatic cases per 1,000 population			< 2 cases per school*
		<50	<25	<10	
Students	Elementary school – <i>half susceptibility</i>	Masks + testing	Masks + cohorts	Not observed**	Not observed**
	Elementary school – <i>equal susceptibility</i>	Masks + cohorts	Not observed**	Not observed**	Not observed**
	Middle school	Masks + cohorts	Masks + cohorts	Not observed**	Not observed**
	High school	Masks + testing	Masks + cohorts	Masks + cohorts	Not observed**
Teachers	Elementary school – <i>half susceptibility</i>	Masks + testing	Masks + cohorts	Not observed**	
	Elementary school – <i>equal susceptibility</i>	Masks + cohorts	Not observed**	Not observed**	
	Middle school	Masks + cohorts	Masks + cohorts	Not observed**	
	High school	Masks + testing	Masks + cohorts	Masks + cohorts	

*Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

**not observed under the specific combination of interventions simulated

Table S5. The minimum non-pharmaceutical intervention to reduce the risk of symptomatic infection to beneath a given threshold (e.g., 50 cases per 1,000 population), assuming that 60% of the vaccine-eligible community has received a vaccine. Other modelling parameters are given in Table S1. ‘Not observed’ indicates that no combination of interventions examined in this study reduced excess risk beneath the indicated threshold.

		Threshold - symptomatic cases per 1,000 population			< 2 cases per school*
		<50	<25	<10	
Students	Elementary school – <i>half susceptibility</i>	Masks	Masks + cohorts	Masks + cohorts	Not observed**
	Elementary school – <i>equal susceptibility</i>	Masks + cohorts	Not observed**	Not observed**	Not observed**
	Middle school	Masks + testing	Masks + cohorts	Masks + cohorts	Not observed**
	High school	Masks	Masks + testing	Masks + cohorts	Not observed**
Teachers	Elementary school – <i>half susceptibility</i>	Masks	Masks + cohorts	Masks + cohorts	
	Elementary school – <i>equal susceptibility</i>	Masks + cohorts	Masks + cohorts	Not observed**	
	Middle school	Masks	Masks + cohorts	Masks + cohorts	
	High school	Masks	Masks + testing	Masks + cohorts	

*Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

**not observed under the specific combination of interventions simulated

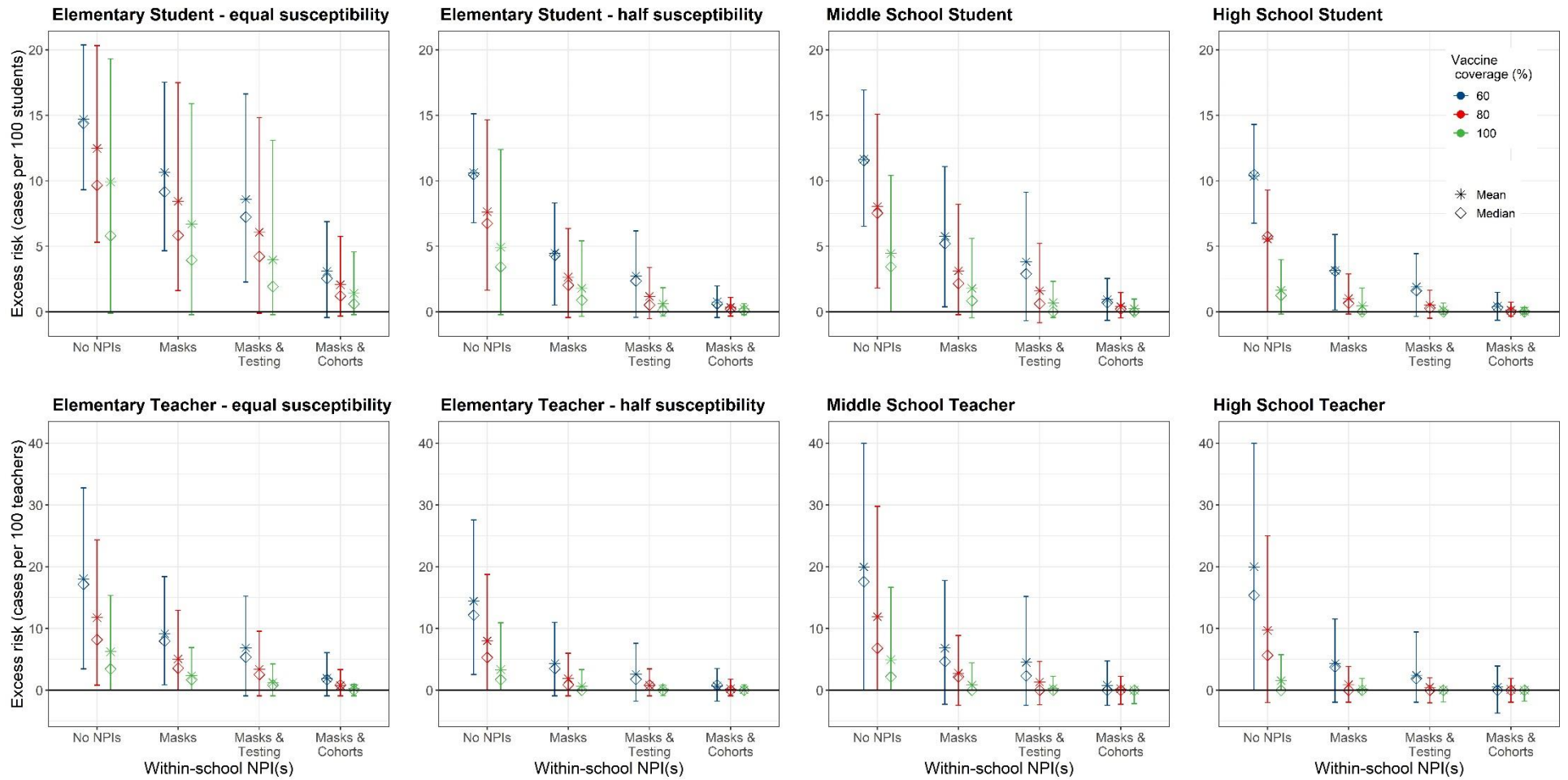


Figure S1. Effect of non-pharmaceutical interventions and vaccine coverages >70%. We examined the effect of three non-pharmaceutical interventions across three levels of community vaccination coverage (50%, 60%, 70%), assuming that vaccination coverage within school children 12+ and teachers matches that in the community and the vaccine effectiveness is 77% against infection, 85% against symptomatic infection, and 93% against severe infection. Masks indicate universal masks regardless of vaccination status. We calculated the mean (stars) and median (diamonds) of excess cases per 100 persons attributable to school transmission among population subgroups across 1,000 model realizations. Vertical lines reflect the 89th percentile high probability density interval (HPDI).

Table S6. Excess *symptomatic* infections attributable to school transmission by population subgroup and scenario examined. Modelling parameters are given in Table S1.

Vaccine coverage (%)	NPI	Susceptibility of children <10 years	Population	Mean (89% HPDI) excess infections per 100 population	Median excess infections per 100 population	Infections per school*
50	None	Equal	Elementary student	15.5 (10.8, 20.3)	15.7	59
50	None	Half	Elementary student	11.9 (9, 15.6)	12	45
50	None		Middle school student	13.1 (8.8, 17.9)	13.2	55
50	None		High school student	12 (8.6, 15.7)	12	81
50	None	Equal	Elementary teacher	21.4 (6, 37.8)	20.4	
50	None	Half	Elementary teacher	18.1 (4.2, 31.9)	17	
50	None		Middle school teacher	23.3 (2.2, 44.2)	22	
50	None		High school teacher	24.1 (3.5, 47.3)	21.6	
50	Masks	Equal	Elementary student	11.7 (5.9, 17.7)	11.2	44
50	Masks	Half	Elementary student	5.7 (1.8, 9.4)	5.8	22
50	Masks		Middle school student	7.5 (1.8, 13.3)	7.1	31
50	Masks		High school student	5.1 (1.3, 8.6)	5.1	35
50	Masks	Equal	Elementary teacher	11.8 (1.7, 22.2)	10.7	
50	Masks	Half	Elementary teacher	6.4 (-0.9, 13.8)	6	
50	Masks		Middle school teacher	10 (-2.3, 23.4)	8.7	
50	Masks		High school teacher	7.6 (-2, 18.2)	6.6	
50	Masks + Testing	Equal	Elementary student	10 (4.2, 16.8)	9.2	38
50	Masks + Testing	Half	Elementary student	3.9 (0.2, 7.1)	3.9	15
50	Masks + Testing		Middle school student	5.7 (0, 10.8)	5.1	24
50	Masks + Testing		High school student	3.5 (0, 6.6)	3.4	24
50	Masks + Testing	Equal	Elementary teacher	9.4 (0, 19.3)	8.5	
50	Masks + Testing	Half	Elementary teacher	4.3 (-2.7, 10.3)	3.5	
50	Masks + Testing		Middle school teacher	7.3 (-2.4, 20)	6.5	
50	Masks + Testing		High school teacher	5.2 (-2, 15.1)	3.8	
50	Masks + Cohorts	Equal	Elementary student	4 (0, 8.3)	3.5	15
50	Masks + Cohorts	Half	Elementary student	1.1 (-0.3, 2.7)	1.1	4
50	Masks + Cohorts		Middle school student	1.5 (-0.7, 3.8)	1.3	6
50	Masks + Cohorts		High school student	0.8 (-0.5, 2.5)	0.7	6
50	Masks + Cohorts	Equal	Elementary teacher	2.9 (-1.8, 7.6)	2.6	
50	Masks + Cohorts	Half	Elementary teacher	1 (-2.7, 4.4)	0.9	
50	Masks + Cohorts		Middle school teacher	1.4 (-4.7, 6.8)	2.1	
50	Masks + Cohorts		High school teacher	1 (-4, 5.8)	0.9	
60	None	Equal	Elementary student	14.7 (9.3, 20.4)	14.4	56
60	None	Half	Elementary student	10.6 (6.8, 15.1)	10.5	40
60	None		Middle school student	11.7 (6.5, 16.9)	11.6	49
60	None		High school student	10.4 (6.8, 14.3)	10.5	70
60	None	Equal	Elementary teacher	18 (3.4, 32.8)	17.2	
60	None	Half	Elementary teacher	14.4 (2.6, 27.6)	12.2	
60	None		Middle school teacher	20 (0, 40)	17.6	
60	None		High school teacher	20 (0, 40)	15.4	
60	Masks	Equal	Elementary student	10.6 (4.7, 17.5)	9.2	40
60	Masks	Half	Elementary student	4.5 (0.5, 8.3)	4.3	17

60	Masks		Middle school student	5.8 (0.4, 11.1)	5.2	24
60	Masks		High school student	3.2 (0.1, 5.9)	3.1	21
60	Masks	Equal	Elementary teacher	9.2 (0.9, 18.4)	8	
60	Masks	Half	Elementary teacher	4.3 (-0.9, 11)	3.5	
60	Masks		Middle school teacher	6.8 (-2.3, 17.8)	4.7	
60	Masks		High school teacher	4.3 (-2, 11.5)	3.8	
60	Masks + Testing	Equal	Elementary student	8.6 (2.3, 16.6)	7.2	33
60	Masks + Testing	Half	Elementary student	2.8 (-0.4, 6.2)	2.4	10
60	Masks + Testing		Middle school student	3.8 (-0.7, 9.1)	2.9	16
60	Masks + Testing		High school student	1.9 (-0.4, 4.4)	1.6	13
60	Masks + Testing	Equal	Elementary teacher	6.9 (-0.9, 15.3)	5.4	
60	Masks + Testing	Half	Elementary teacher	2.6 (-1.8, 7.6)	1.8	
60	Masks + Testing		Middle school teacher	4.5 (-2.4, 15.2)	2.3	
60	Masks + Testing		High school teacher	2.4 (-2, 9.4)	1.9	
60	Masks + Cohorts	Equal	Elementary student	3.1 (-0.4, 6.9)	2.5	12
60	Masks + Cohorts	Half	Elementary student	0.8 (-0.4, 2)	0.6	3
60	Masks + Cohorts		Middle school student	0.9 (-0.7, 2.6)	0.7	4
60	Masks + Cohorts		High school student	0.4 (-0.6, 1.5)	0.3	3
60	Masks + Cohorts	Equal	Elementary teacher	1.9 (-0.9, 6.1)	1.7	
60	Masks + Cohorts	Half	Elementary teacher	0.7 (-1.8, 3.5)	0.8	
60	Masks + Cohorts		Middle school teacher	0.8 (-2.4, 4.8)	0	
60	Masks + Cohorts		High school teacher	0.5 (-3.7, 3.9)	0	
70	None	Equal	Elementary student	13.5 (7.3, 20.1)	11.6	51
70	None	Half	Elementary student	9.1 (4.3, 15)	8.7	35
70	None		Middle school student	9.9 (4.7, 16.4)	9.7	41
70	None		High school student	8.2 (3.9, 12.8)	8.2	56
70	None	Equal	Elementary teacher	14.6 (2.5, 28.8)	10.8	
70	None	Half	Elementary teacher	10.8 (0, 21.8)	8	
70	None		Middle school teacher	16 (0, 35)	11.1	
70	None		High school teacher	15.2 (0, 35.3)	9.6	
70	Masks	Equal	Elementary student	9.5 (3, 17.8)	7.3	36
70	Masks	Half	Elementary student	3.4 (-0.2, 7.2)	3	13
70	Masks		Middle school student	4.3 (0, 9.7)	3.4	18
70	Masks		High school student	1.8 (-0.2, 3.9)	1.6	12
70	Masks	Equal	Elementary teacher	6.9 (0, 15.7)	5.9	
70	Masks	Half	Elementary teacher	2.8 (-0.9, 7.8)	1.8	
70	Masks		Middle school teacher	4.5 (-2.3, 13.3)	2.3	
70	Masks		High school teacher	2.1 (-2.1, 5.9)	1.9	
70	Masks + Testing	Equal	Elementary student	7.4 (0.6, 15.7)	5.6	28
70	Masks + Testing	Half	Elementary student	1.8 (-0.5, 4.4)	1.2	7
70	Masks + Testing		Middle school student	2.4 (-0.5, 7.2)	1.4	10
70	Masks + Testing		High school student	0.9 (-0.5, 2.7)	0.6	6
70	Masks + Testing	Equal	Elementary teacher	4.9 (-0.9, 12.9)	3.5	
70	Masks + Testing	Half	Elementary teacher	1.4 (-1.8, 4.3)	0.9	
70	Masks + Testing		Middle school teacher	2.4 (-2.4, 9.1)	2.1	
70	Masks + Testing		High school teacher	1 (-2, 5.6)	0	

70	Masks + Cohorts	Equal	Elementary student	2.5 (-0.4, 5.7)	1.8	9
70	Masks + Cohorts	Half	Elementary student	0.5 (-0.3, 1.6)	0.4	2
70	Masks + Cohorts		Middle school student	0.6 (-0.7, 2)	0.4	3
70	Masks + Cohorts		High school student	0.2 (-0.3, 1.1)	0.2	2
70	Masks + Cohorts	Equal	Elementary teacher	1.2 (-0.9, 4.4)	0.9	
70	Masks + Cohorts	Half	Elementary teacher	0.4 (-1.8, 2.6)	0	
70	Masks + Cohorts		Middle school teacher	0.6 (-2.3, 4.4)	0	
70	Masks + Cohorts		High school teacher	0.2 (-2, 3.7)	0	

*Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

Table S7. Excess infections (including asymptomatic infection) attributable to school transmission by population subgroup and scenario examined. Modelling parameters are given in Table S1.

Vaccine coverage (%)	NPI	Susceptibility of children <10 years	Population	Mean (89% HPDI) excess infections per 100 population	Median excess infections per 100 population	Infections per school*
50	None	Equal	Elementary student	64.5 (37.7, 90.7)	64	245
50	None	Half	Elementary student	48.6 (30.8, 70)	41.1	185
50	None		Middle school student	56.9 (30.8, 85)	46.4	239
50	None		High school student	54.2 (31.8, 82.3)	43.6	368
50	None	Equal	Elementary teacher	37.2 (16.4, 58.6)	36.8	
50	None	Half	Elementary teacher	31.1 (12.2, 50.4)	28.7	
50	None		Middle school teacher	40.6 (8.7, 69.6)	37.4	
50	None		High school teacher	41.8 (10.9, 74.5)	35.8	
50	Masks	Equal	Elementary student	49.8 (21.9, 80.2)	35.1	189
50	Masks	Half	Elementary student	23.5 (7.2, 42.2)	21.5	89
50	Masks		Middle school student	32.9 (6.9, 62.6)	24.2	138
50	Masks		High school student	21.9 (6.3, 40.9)	20.3	149
50	Masks	Equal	Elementary teacher	20.4 (6.8, 33.9)	19.3	
50	Masks	Half	Elementary teacher	11 (0.8, 21.5)	10.5	
50	Masks		Middle school teacher	16.8 (0, 37)	14.3	
50	Masks		High school teacher	13.2 (-2, 26.9)	11.5	
50	Masks + Testing	Equal	Elementary student	43.1 (16.2, 76.3)	31.5	164
50	Masks + Testing	Half	Elementary student	16.4 (2.5, 33.3)	14.7	62
50	Masks + Testing		Middle school student	25.3 (1.8, 54.1)	18	106
50	Masks + Testing		High school student	15.5 (1.1, 30.4)	14.1	106
50	Masks + Testing	Equal	Elementary teacher	16.3 (2.6, 29.3)	15.5	
50	Masks + Testing	Half	Elementary teacher	7.6 (-1.8, 16.4)	6.9	
50	Masks + Testing		Middle school teacher	12.3 (-2.4, 30.4)	10.9	
50	Masks + Testing		High school teacher	8.9 (-2, 22.6)	7.5	
50	Masks + Cohorts	Equal	Elementary student	17.1 (0.5, 36.6)	12.4	65
50	Masks + Cohorts	Half	Elementary student	4.5 (-1.2, 9)	3.9	17
50	Masks + Cohorts		Middle school student	6 (-1.8, 13.8)	4.3	25
50	Masks + Cohorts		High school student	3.3 (-0.6, 7.2)	2.9	22
50	Masks + Cohorts	Equal	Elementary teacher	5.1 (-0.9, 11.8)	5.1	
50	Masks + Cohorts	Half	Elementary teacher	1.8 (-3.6, 6.8)	1.7	
50	Masks + Cohorts		Middle school teacher	2.3 (-4.9, 11.1)	2.2	
50	Masks + Cohorts		High school teacher	1.7 (-4, 9.3)	1.9	
60	None	Equal	Elementary student	63 (35.5, 92.5)	45.3	240
60	None	Half	Elementary student	44.8 (25.9, 69.9)	37.2	170
60	None		Middle school student	53.1 (26.9, 83.8)	40.2	223
60	None		High school student	48.9 (26.9, 77.6)	38	333
60	None	Equal	Elementary teacher	32.8 (12.8, 54.3)	29.5	
60	None	Half	Elementary teacher	25.9 (10.1, 46.6)	22.7	
60	None		Middle school teacher	35.9 (6.4, 65.2)	29.5	
60	None		High school teacher	36.2 (9.1, 70.4)	28.2	
60	Masks	Equal	Elementary student	46.6 (18.4, 80.7)	30.7	177
60	Masks	Half	Elementary student	19.2 (4.1, 40.3)	16.3	73

60	Masks		Middle school student	26.2 (4.2, 56.4)	18	110
60	Masks		High school student	13.7 (-0.2, 23.4)	13.1	93
60	Masks	Equal	Elementary teacher	16.5 (3.4, 29.2)	15.7	
60	Masks	Half	Elementary teacher	7.9 (0, 16.7)	7	
60	Masks		Middle school teacher	12.2 (0, 30.4)	9.3	
60	Masks		High school teacher	7.7 (-2, 17.6)	7.3	
60	Masks + Testing	Equal	Elementary student	38 (9.3, 76.3)	25.5	145
60	Masks + Testing	Half	Elementary student	12 (-0.9, 27.8)	9.5	46
60	Masks + Testing		Middle school student	17.7 (-1.7, 45)	11.2	74
60	Masks + Testing		High school student	8.3 (-1.4, 17.3)	7.2	57
60	Masks + Testing	Equal	Elementary teacher	12.5 (0.9, 25.2)	11.2	
60	Masks + Testing	Half	Elementary teacher	4.6 (-1.8, 12.2)	3.5	
60	Masks + Testing		Middle school teacher	7.8 (-4.5, 21.4)	4.7	
60	Masks + Testing		High school teacher	4.6 (-2, 14.3)	3.8	
60	Masks + Cohorts	Equal	Elementary student	13.8 (-0.1, 33.1)	9.4	53
60	Masks + Cohorts	Half	Elementary student	3.2 (-0.7, 7.7)	2.4	12
60	Masks + Cohorts		Middle school student	4.1 (-2, 10)	2.7	17
60	Masks + Cohorts		High school student	1.8 (-1, 4.3)	1.5	12
60	Masks + Cohorts	Equal	Elementary teacher	3.4 (-1.8, 8.4)	3.4	
60	Masks + Cohorts	Half	Elementary teacher	1.2 (-1.8, 5.3)	0.9	
60	Masks + Cohorts		Middle school teacher	1.5 (-4.5, 6.7)	2.1	
60	Masks + Cohorts		High school teacher	1 (-3.9, 5.9)	1.8	
70	None	Equal	Elementary student	60.1 (30.7, 92.2)	39.8	228
70	None	Half	Elementary student	39.9 (19.1, 69.1)	32.4	152
70	None		Middle school student	47.3 (20.9, 80.7)	34.3	199
70	None		High school student	28 (7.9, 48.3)	22.2	
70	None	Equal	Elementary teacher	20.6 (5.2, 40.4)	16.9	
70	None	Half	Elementary teacher	30 (2.1, 59.5)	22.2	
70	None		Middle school teacher	40.5 (18.4, 72.2)	31.9	
70	None		High school teacher	28.9 (3.6, 62.3)	20	
70	Masks	Equal	Elementary student	42.7 (13.5, 81.3)	25.4	162
70	Masks	Half	Elementary student	15 (0, 34)	12	57
70	Masks		Middle school student	20.3 (-0.5, 47.1)	13.5	85
70	Masks		High school student	7.9 (-0.3, 15.3)	7.6	54
70	Masks	Equal	Elementary teacher	13.1 (0.8, 24.8)	11.9	
70	Masks	Half	Elementary teacher	5.5 (-0.9, 12.8)	4.5	
70	Masks		Middle school teacher	8.3 (-2.3, 20.8)	6.5	
70	Masks		High school teacher	4.2 (-2, 11.1)	3.7	
70	Masks + Testing	Equal	Elementary student	33.3 (5, 75.5)	21.2	126
70	Masks + Testing	Half	Elementary student	7.7 (-1.3, 19.5)	5.2	29
70	Masks + Testing		Middle school student	11.1 (-1.3, 33.7)	5.9	47
70	Masks + Testing		High school student	4 (-0.9, 9.7)	2.8	27
70	Masks + Testing	Equal	Elementary teacher	9.4 (-0.9, 20.7)	7.8	
70	Masks + Testing	Half	Elementary teacher	2.7 (-1.8, 7.6)	1.8	
70	Masks + Testing		Middle school teacher	4.3 (-4.5, 13.6)	2.3	
70	Masks + Testing		High school teacher	2 (-2, 7.7)	1.9	

70	Masks + Cohorts	Equal	Elementary student	11.4 (-0.8, 27.5)	7.3	43
70	Masks + Cohorts	Half	Elementary student	2.3 (-0.7, 6.1)	1.5	9
70	Masks + Cohorts		Middle school student	2.9 (-1.1, 7.9)	1.5	12
70	Masks + Cohorts		High school student	1 (-0.6, 3.2)	0.8	7
70	Masks + Cohorts	Equal	Elementary teacher	2.4 (-0.9, 7)	1.8	
70	Masks + Cohorts	Half	Elementary teacher	0.8 (-1.8, 3.5)	0.9	
70	Masks + Cohorts		Middle school teacher	1.1 (-2.4, 6.7)	0	
70	Masks + Cohorts		High school teacher	0.4 (-3.8, 3.8)	0	

*Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

Table S8. Excess hospitalizations attributable to school transmission using parameters specified in Table S1. Results are stratified by levels of community vaccination coverage and within-school non-pharmaceutical intervention (NPI). M/T = masks + testing; M/C = masks + cohorts.

NPI	Susceptibility of children <10 years	Population	50% coverage		60% coverage		70% coverage	
			Mean (89% HPDI) excess hospitalizations per 100,00 population	Median excess hospitalizations per 100,00 population	Mean (89% HPDI) excess hospitalizations per 100,00 population	Median excess hospitalizations per 100,00 population	Mean (89% HPDI) excess hospitalizations per 100,00 population	Median excess hospitalizations per 100,00 population
None	Equal	Elementary student	12.9 (0, 41.8)	0	10.3 (0, 31.9)	0	6.5 (0, 21.5)	0
None	Half	Elementary student	11.4 (0, 41)	0	8.2 (0, 30.9)	0	5.2 (0, 21.1)	0
None		Middle school student	12.6 (0, 44.2)	0	8.3 (0, 40.4)	0	6.9 (0, 22.8)	0
None		High school student	12.3 (0, 46.5)	0	8.7 (0, 33)	0	5.7 (0, 21.8)	0
None	Equal	Elementary teacher	68.9 (0, 252.1)	84	58.4 (0, 175.4)	0	6.4 (0, 30.8)	0
None	Half	Elementary teacher	66.1 (0, 177)	84	53 (0, 173.9)	0	42 (0, 170.9)	0
None		Middle school teacher	77.7 (0, 232.6)	0	69.1 (0, 227.3)	0	31.8 (0, 89.3)	0
None		High school teacher	83 (0, 357.1)	0	62.3 (0, 196.1)	0	50.9 (0, 222.2)	0
Masks	Equal	Elementary student	8.1 (0, 31.5)	0	5.5 (0, 22.1)	0	3.4 (0, 20.2)	0
Masks	Half	Elementary student	5.1 (0, 31.4)	0	3.1 (0, 21.4)	0	1.8 (0, 10.9)	0
Masks		Middle school student	5.4 (0, 40.2)	0	3.2 (0, 21.7)	0	1.7 (0, 20.4)	0
Masks		High school student	4.8 (0, 34.4)	0	3.2 (0, 17.8)	0	1.6 (0, 16.2)	0
Masks	Equal	Elementary teacher	40.1 (0, 170.9)	0	30.7 (0, 90.1)	0	17.5 (0, 87.7)	0
Masks	Half	Elementary teacher	24.8 (0, 168.1)	0	12.6 (0, 87.7)	0	6.3 (0, 85.5)	0
Masks		Middle school teacher	29.4 (0, 222.2)	0	24.2 (0, 217.4)	0	14.2 (0, 0)	0
Masks		High school teacher	21.9 (0, 188.7)	0	13.9 (0, 178.6)	0	6.5 (0, 0)	0
M/T	Equal	Elementary student	6.4 (0, 31.4)	0	3.8 (0, 21)	0	2.3 (0, 10.7)	0
M/T	Half	Elementary student	3.2 (-10.7, 20.8)	0	1.8 (0, 20.9)	0	0.7 (0, 10.4)	0
M/T		Middle school student	4.1 (0, 41.2)	0	2.3 (0, 21.3)	0	2.2 (0, 20.7)	0
M/T		High school student	4.1 (0, 45.9)	0	1.3 (0, 16.3)	0	0.6 (0, 0)	0
M/T	Equal	Elementary teacher	30.7 (0, 172.4)	0	22.6 (0, 88.5)	0	0.9 (0, 15.8)	0
M/T	Half	Elementary teacher	18.7 (0, 89.3)	0	8.7 (0, 87.7)	0	14.2 (0, 87.7)	0
M/T		Middle school teacher	22.1 (0, 222.2)	0	17.6 (0, 0)	0	3.5 (0, 0)	0
M/T		High school teacher	18.2 (0, 192.3)	0	9.3 (0, 0)	0	9.5 (0, 0)	0
M/C	Equal	Elementary student	1.8 (-10.9, 11.1)	0	1.3 (0, 20.6)	0	1 (0, 10.5)	0
M/C	Half	Elementary student	1.2 (-10.9, 10.9)	0	0.5 (-10.5, 10.6)	0	0.3 (0, 10.6)	0
M/C		Middle school student	1.6 (0, 40.6)	0	0.4 (-20.7, 0)	0	0.5 (0, 0)	0

M/C		High school student	1 (-16.1, 16.2)	0	0.3 (0, 16.7)	0	-0.1 (-14.7, 0)	0
M/C	Equal	Elementary teacher	9.6 (0, 89.3)	0	6.5 (0, 87.7)	0	2.1 (0, 0)	0
M/C	Half	Elementary teacher	7 (0, 87.7)	0	1.9 (-86.2, 0)	0	1 (0, 0)	0
M/C		Middle school teacher	4.6 (0, 0)	0	4.4 (0, 0)	0	5.1 (0, 0)	0
M/C		High school teacher	3.5 (-185.2, 0)	0	2.1 (0, 0)	0	0.8 (0, 0)	0

Table S9. Excess infections (all, symptomatic, and severe) among household members of students and general community members, stratified by vaccination coverage and within-school intervention. Modelling parameters are as seen in Table S1.

Vaccination coverage (%)	Population	Within –school intervention	Excess infections (any) per 100 population		Excess symptomatic infections per 100 population		Excess hospitalizations per 100,000 population	
			Mean (89% HPDI)	Median	Mean (89% HPDI)	Median	Mean (89% HPDI)	Median
50	Community member	No NPIs	14.7 (10.2, 20.3)	14.7	8.6 (6.1, 11.5)	8.8	34.9 (19.2, 50.8)	35.3
50	Household member	No NPIs	26.4 (15.2, 39.2)	23.5	10.9 (8.5, 13.6)	11.1	34.7 (8.2, 65.4)	33.8
50	Community member	Masks	6 (0.9, 10.9)	6	3.5 (0.5, 6.4)	3.5	14.1 (0.9, 29.8)	14.1
50	Household member	Masks	12.1 (2.3, 21.9)	10.9	4.9 (1.4, 8.1)	5.1	15.7 (-4.5, 38.5)	12.9
50	Community member	Masks +testing	3.8 (-0.7, 8)	3.8	2.2 (-0.7, 4.5)	2.1	8.9 (-4.5, 22)	8.8
50	Household member	Masks +testing	8.3 (0, 17.5)	7.4	3.3 (0.1, 6.3)	3.3	9.4 (-8.9, 30.1)	8.5
50	Community member	Masks +cohorts	1.1 (-1.7, 3.6)	1.1	0.7 (-1.2, 2.2)	0.6	2.6 (-7.1, 13.2)	2.6
50	Household member	Masks +cohorts	2.2 (-1, 5.3)	2.1	0.9 (-0.7, 2.5)	0.9	2.6 (-13.1, 20.7)	4.1
60	Community member	No NPIs	11 (6.6, 16.4)	11	6.1 (3.5, 8.6)	6.3	23.8 (11.3, 38)	23.9
60	Household member	No NPIs	22.3 (11.2, 36.6)	18.9	8.6 (5.9, 11.5)	8.9	25.1 (0, 47)	24.9
60	Community member	Masks	3.7 (0.4, 7.4)	3.6	2.1 (0.2, 4.1)	2	7.9 (-0.9, 18.4)	7.9
60	Household member	Masks	8.4 (0.3, 16.3)	7.4	3.2 (0.8, 6)	3.2	9.1 (-4.4, 25.7)	8.5
60	Community member	Masks +testing	2.1 (-0.8, 5.2)	1.9	1.1 (-0.5, 2.9)	1	4.4 (-4.4, 14)	3.6
60	Household member	Masks +testing	5.1 (-1, 12)	4.2	1.9 (-0.3, 4.5)	1.8	5.4 (-8.7, 21.3)	4.3
60	Community member	Masks +cohorts	0.7 (-1, 2.4)	0.6	0.4 (-0.7, 1.4)	0.3	1.5 (-5.3, 8.9)	1.7
60	Household member	Masks +cohorts	1.4 (-0.9, 3.9)	1.3	0.5 (-0.6, 1.7)	0.5	1.3 (-8.7, 13)	0
70	Community member	No NPIs	7.3 (3.2, 12.6)	7.4	3.8 (1.6, 6.2)	4	14.1 (2.6, 23.9)	14.2
70	Household member	No NPIs	17.7 (5.7, 32.3)	13.4	6.2 (3.2, 9.5)	6.5	16 (0, 34.1)	13
70	Community member	Masks	2.2 (-0.4, 4.6)	2	1.1 (-0.2, 2.4)	1	4.1 (-1.8, 11.5)	3.5
70	Household member	Masks	5.8 (-0.7, 13)	4.6	2 (0, 4)	1.9	4.7 (-4.4, 17.1)	4.2
70	Community member	Masks +testing	1 (-0.6, 3)	0.7	0.5 (-0.5, 1.5)	0.4	1.9 (-3.6, 7.9)	1.8
70	Household member	Masks +testing	2.9 (-1, 8.5)	1.7	1 (-0.5, 2.7)	0.8	2.1 (-4.4, 16.7)	0
70	Community member	Masks +cohorts	0.3 (-0.7, 1.3)	0.3	0.2 (-0.4, 0.8)	0.2	0.7 (-3.5, 5.3)	0.9
70	Household member	Masks +cohorts	0.9 (-0.6, 2.6)	0.7	0.3 (-0.5, 1)	0.3	0.7 (-8.6, 8.6)	0

Supplemental results assuming lower infectiousness of asymptomatic individuals

In the main text, we assume that asymptomatic individuals are 50% as likely to transmit infection as compared to symptomatic individuals. Here, we explore results, assuming they are 30% as likely to transmit. In equation 1, this corresponds to an α value of 0.3.

Table S10. The minimum non-pharmaceutical intervention to reduce the risk of symptomatic infection to beneath a given threshold (e.g., 50 cases per 1,000 population), assuming that 70% of the vaccine-eligible community has received a vaccine and the relative infectiousness of asymptomatic individuals (α) is 0.3. All other modelling parameters besides α are given in Table S1. ‘Not observed’ indicates that no combination of interventions examined in this study reduced excess risk beneath the indicated threshold.

		Threshold - symptomatic cases per 1,000 population			< 2 cases per school*
		<50	<25	<10	
Students	Elementary school – <i>half susceptibility</i>	Masks	Masks	Masks + testing	Masks + testing
	Elementary school – <i>equal susceptibility</i>	Masks + testing	Masks + cohorts	Masks + cohorts	Not observed**
	Middle school	Masks	Masks	Masks + testing	Masks + cohorts
	High school	Masks	Masks	Masks	Masks + testing
Teachers	Elementary school – <i>half susceptibility</i>	Masks	Masks	Masks	
	Elementary school – <i>equal susceptibility</i>	Masks	Masks + testing	Masks + testing	
	Middle school	Masks	Masks	Masks + testing	
	High school	Masks	Masks	Masks	

*Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

**not observed under the specific combination of interventions simulated

Table S11. Excess *symptomatic* infections attributable to school transmission by population subgroup and scenario examined, using parameters in Table S1 and $\alpha = 0.3$

Vaccine coverage (%)	NPI	Susceptibility of children <10 years	Population	Mean (89% HPDI) excess infections per 100 population	Median excess infections per 100 population	Infections per school*
50	None	Equal	Elementary student	13.2 (8.2, 18.9)	13.1	50
50	None	Half	Elementary student	8.2 (4.7, 11.7)	8.3	31
50	None		Middle school student	10.9 (5.2, 17)	10.7	46
50	None		High school student	9.8 (4.9, 14.2)	9.7	67
50	None	Equal	Elementary teacher	16.9 (3.4, 32.2)	14.5	
50	None	Half	Elementary teacher	11.8 (1.7, 23.7)	10.4	
50	None		Middle school teacher	19.1 (0, 40.4)	15.6	
50	None		High school teacher	19.5 (0, 40.7)	15.4	
50	Masks	Equal	Elementary student	7.4 (1.9, 13.7)	6.5	28
50	Masks	Half	Elementary student	2.5 (0, 4.9)	2.4	10
50	Masks		Middle school student	4.1 (0, 9.3)	3.5	17
50	Masks		High school student	2.2 (0, 4.8)	2	15
50	Masks	Equal	Elementary teacher	6.5 (0, 15.5)	5.3	
50	Masks	Half	Elementary teacher	2.8 (-1.8, 7.9)	2.6	
50	Masks		Middle school teacher	5 (-4.5, 15.2)	4.3	
50	Masks		High school teacher	3.1 (-3.9, 9.4)	2	
50	Masks + Testing	Equal	Elementary student	5.6 (-0.1, 11.3)	4.7	21
50	Masks + Testing	Half	Elementary student	1.5 (-0.5, 3.5)	1.3	6
50	Masks + Testing		Middle school student	2.6 (-0.4, 7.1)	1.9	11
50	Masks + Testing		High school student	1.3 (-0.5, 3.3)	1.1	9
50	Masks + Testing	Equal	Elementary teacher	4.4 (-1.8, 11.4)	3.5	
50	Masks + Testing	Half	Elementary teacher	1.5 (-2.7, 5.3)	1.7	
50	Masks + Testing		Middle school teacher	2.7 (-4.7, 9.5)	2.2	
50	Masks + Testing		High school teacher	1.8 (-3.8, 7.4)	1.9	
50	Masks + Cohorts	Equal	Elementary student	1.5 (-0.4, 3.7)	1.3	6
50	Masks + Cohorts	Half	Elementary student	0.5 (-0.6, 1.8)	0.5	2
50	Masks + Cohorts		Middle school student	0.6 (-1, 2.3)	0.6	3
50	Masks + Cohorts		High school student	0.3 (-0.8, 1.6)	0.3	2
50	Masks + Cohorts	Equal	Elementary teacher	1 (-1.8, 5.1)	0.9	
50	Masks + Cohorts	Half	Elementary teacher	0.5 (-2.7, 3.6)	0.8	
50	Masks + Cohorts		Middle school teacher	0.5 (-4.7, 4.9)	0	
50	Masks + Cohorts		High school teacher	0.4 (-4, 4.1)	0	
60	None	Equal	Elementary student	12.1 (6.7, 19)	10.9	46
60	None	Half	Elementary student	6.7 (3, 11.4)	6.7	26
60	None		Middle school student	9.2 (3.4, 16)	8.7	39
60	None		High school student	7.6 (3.4, 12.9)	7.3	51
60	None	Equal	Elementary teacher	13.6 (1.7, 27.1)	11.1	
60	None	Half	Elementary teacher	8.7 (0, 18.3)	7.1	
60	None		Middle school teacher	15.4 (0, 36.2)	12.5	
60	None		High school teacher	14.5 (0, 34)	9.6	
60	Masks	Equal	Elementary student	6.5 (0.5, 12.6)	5.3	25
60	Masks	Half	Elementary student	1.8 (-0.3, 3.9)	1.6	7

60	Masks		Middle school student	2.8 (-0.7, 7)	2	12
60	Masks		High school student	1.2 (-0.3, 2.9)	1	8
60	Masks	Equal	Elementary teacher	4.9 (-0.9, 11.6)	4.2	
60	Masks	Half	Elementary teacher	1.7 (-1.8, 5.2)	1.7	
60	Masks		Middle school teacher	2.9 (-2.3, 10.9)	2.2	
60	Masks		High school teacher	1.6 (-2, 7.3)	1.8	
60	Masks + Testing	Equal	Elementary student	4.2 (-0.4, 9.9)	3.2	16
60	Masks + Testing	Half	Elementary student	0.9 (-0.4, 2.5)	0.7	3
60	Masks + Testing		Middle school student	1.4 (-1.2, 4.1)	0.8	6
60	Masks + Testing		High school student	0.6 (-0.5, 2)	0.5	4
60	Masks + Testing	Equal	Elementary teacher	2.9 (-1.8, 8)	2.5	
60	Masks + Testing	Half	Elementary teacher	0.7 (-1.8, 3.6)	0.8	
60	Masks + Testing		Middle school teacher	1.2 (-2.4, 8.7)	0	
60	Masks + Testing		High school teacher	0.8 (-2.1, 5.7)	0	
60	Masks + Cohorts	Equal	Elementary student	1.2 (-0.8, 3.2)	0.9	5
60	Masks + Cohorts	Half	Elementary student	0.3 (-0.5, 1.3)	0.3	1
60	Masks + Cohorts		Middle school student	0.4 (-0.9, 1.6)	0.2	2
60	Masks + Cohorts		High school student	0.2 (-0.5, 1.2)	0.2	1
60	Masks + Cohorts	Equal	Elementary teacher	0.8 (-1.8, 3.5)	0.9	
60	Masks + Cohorts	Half	Elementary teacher	0.2 (-1.8, 2.7)	0	
60	Masks + Cohorts		Middle school teacher	0.2 (-4.4, 4.4)	0	
60	Masks + Cohorts		High school teacher	0.2 (-3.6, 3.9)	0	
70	None	Equal	Elementary student	10.9 (4.6, 18.9)	8.9	42
70	None	Half	Elementary student	5.3 (0.9, 10)	5	20
70	None		Middle school student	7.3 (0.2, 13.5)	6.5	30
70	None		High school student	5 (0, 8.7)	5	34
70	None	Equal	Elementary teacher	10.7 (0, 22.1)	7.9	
70	None	Half	Elementary teacher	5.8 (-0.9, 14.5)	4.3	
70	None		Middle school teacher	11.3 (-2.3, 28.3)	6.7	
70	None		High school teacher	9.1 (-2, 24.5)	5.5	
70	Masks	Equal	Elementary student	5.6 (-0.2, 12.1)	4.1	21
70	Masks	Half	Elementary student	1.3 (-0.3, 3.2)	1	5
70	Masks		Middle school student	2 (-0.5, 5.9)	1.1	8
70	Masks		High school student	0.7 (-0.3, 1.9)	0.5	4
70	Masks	Equal	Elementary teacher	3.4 (-0.9, 9.3)	2.6	
70	Masks	Half	Elementary teacher	1 (-1.8, 3.4)	0.9	
70	Masks		Middle school teacher	1.6 (-2.4, 6.5)	0	
70	Masks		High school teacher	0.9 (-2, 3.8)	0	
70	Masks + Testing	Equal	Elementary student	3.4 (-0.4, 9.3)	2.3	13
70	Masks + Testing	Half	Elementary student	0.5 (-0.5, 1.5)	0.3	2
70	Masks + Testing		Middle school student	0.8 (-0.7, 2.7)	0.4	3
70	Masks + Testing		High school student	0.3 (-0.5, 1.1)	0.2	2
70	Masks + Testing	Equal	Elementary teacher	1.9 (-1.8, 6.1)	0.9	
70	Masks + Testing	Half	Elementary teacher	0.3 (-1.8, 2.6)	0	
70	Masks + Testing		Middle school teacher	0.7 (-2.3, 4.4)	0	
70	Masks + Testing		High school teacher	0.3 (-2, 3.7)	0	

70	Masks + Cohorts	Equal	Elementary student	0.9 (-0.4, 2.7)	0.6	3
70	Masks + Cohorts	Half	Elementary student	0.2 (-0.3, 0.9)	0.2	1
70	Masks + Cohorts		Middle school student	0.3 (-0.7, 1.1)	0.2	1
70	Masks + Cohorts		High school student	0.1 (-0.5, 0.7)	0	1
70	Masks + Cohorts	Equal	Elementary teacher	0.4 (-1.8, 2.6)	0	
70	Masks + Cohorts	Half	Elementary teacher	0.1 (-1.8, 1.8)	0	
70	Masks + Cohorts		Middle school teacher	0.2 (-2.3, 2.3)	0	
70	Masks + Cohorts		High school teacher	0.1 (-3.6, 2)	0	

*Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

Table S12. Excess infections (including asymptomatic infection) attributable to school transmission by population subgroup and scenario examined, using parameters in Table S1 and $\alpha = 0.3$.

Vaccine coverage (%)	NPI	Susceptibility of children <10 years	Population	Mean (89% HPDI) excess infections per 100 population	Median excess infections per 100 population	Infections per school*
50	None	Equal	Elementary student	56.2 (30.9, 85.3)	41.1	214
50	None	Half	Elementary student	34 (20.9, 54.8)	30.8	129
50	None		Middle school student	49 (21.6, 81.4)	35	206
50	None		High school student	44.9 (21.8, 74.3)	33.8	305
50	None	Equal	Elementary teacher	29 (10.3, 49.2)	26.4	
50	None	Half	Elementary teacher	20.6 (5.9, 36.2)	19.1	
50	None		Middle school teacher	33.1 (6.4, 65.1)	26.8	
50	None		High school teacher	33.4 (5.7, 66.1)	25.9	
50	Masks	Equal	Elementary student	32.5 (7, 62.6)	22.8	124
50	Masks	Half	Elementary student	10.5 (0.4, 19.4)	9.4	40
50	Masks		Middle school student	18.5 (0.7, 42.3)	12.1	78
50	Masks		High school student	11.2 (0, 21)	10.4	
50	Masks	Equal	Elementary teacher	4.8 (-1.8, 11.6)	4.4	
50	Masks	Half	Elementary teacher	8.4 (-4.8, 22.2)	6.7	
50	Masks		Middle school teacher	5.4 (-3.9, 13.7)	5.5	
50	Masks		High school teacher	24.3 (1.6, 53.1)	17	92
50	Masks + Testing	Equal	Elementary student	6.2 (-1, 12.7)	5.2	24
50	Masks + Testing	Half	Elementary student	11.6 (-1.4, 29.8)	7	49
50	Masks + Testing		Middle school student	5.8 (-0.5, 13)	4.9	39
50	Masks + Testing		High school student	7.7 (-1.8, 16.8)	7	
50	Masks + Testing	Equal	Elementary teacher	2.7 (-2.7, 8.5)	2.6	
50	Masks + Testing	Half	Elementary teacher	4.7 (-4.9, 16.3)	4.3	
50	Masks + Testing		Middle school teacher	3.1 (-3.8, 11.5)	2	
50	Masks + Testing		High school teacher	6.8 (-1.1, 15.2)	5	26
50	Masks + Cohorts	Equal	Elementary student	2.1 (-1, 5.3)	1.8	8
50	Masks + Cohorts	Half	Elementary student	2.8 (-1.3, 7.9)	2.1	12
50	Masks + Cohorts		Middle school student	1.5 (-1.1, 4.3)	1.2	10
50	Masks + Cohorts		High school student	1.7 (-3.6, 5.8)	1.7	
50	Masks + Cohorts	Equal	Elementary teacher	0.9 (-3.5, 5.3)	0.9	
50	Masks + Cohorts	Half	Elementary teacher	0.9 (-4.7, 8.7)	0	
50	Masks + Cohorts		Middle school teacher	0.8 (-5.8, 5.9)	0	
50	Masks + Cohorts		High school teacher	53 (25.6, 84.8)	37	201
60	None	Equal	Elementary student	28.7 (12.6, 50.9)	26.2	109
60	None	Half	Elementary student	42.9 (15.7, 76.4)	30.8	180
60	None		Middle school student	36.3 (14.8, 67.3)	28	247
60	None		High school student	24.4 (6.8, 44)	21.2	
60	None	Equal	Elementary teacher	15.5 (1.7, 29.3)	13.8	
60	None	Half	Elementary teacher	26.9 (0, 54.3)	21.5	
60	None		Middle school teacher	26 (1.8, 54)	18.5	
60	None		High school teacher	29.2 (5.6, 61.7)	19.3	111
60	Masks	Equal	Elementary student	7.7 (-0.4, 16.1)	6.3	29
60	Masks	Half	Elementary student	12.9 (-0.9, 34.5)	7.6	54

60	Masks		Middle school student	5.4 (-0.7, 11)	4.4	37
60	Masks		High school student	8.7 (0, 18.3)	7.8	
60	Masks	Equal	Elementary teacher	3 (-1.8, 8)	2.6	
60	Masks	Half	Elementary teacher	5 (-4.7, 15.2)	4.3	
60	Masks		Middle school teacher	3 (-2, 9.8)	2	
60	Masks		High school teacher	18.9 (-0.5, 47.2)	12.8	72
60	Masks + Testing	Equal	Elementary student	3.8 (-0.8, 8.8)	2.7	14
60	Masks + Testing	Half	Elementary student	6.5 (-2.1, 17.8)	3.2	28
60	Masks + Testing		Middle school student	2.8 (-1.1, 7.1)	2	19
60	Masks + Testing		High school student	5.3 (-1.8, 13.2)	4.4	
60	Masks + Testing	Equal	Elementary teacher	1.3 (-1.8, 6.1)	0.9	
60	Masks + Testing	Half	Elementary teacher	2.3 (-4.8, 10.9)	2.2	
60	Masks + Testing		Middle school teacher	1.5 (-3.8, 7.4)	1.8	
60	Masks + Testing		High school teacher	5.4 (-1.2, 14.3)	3.4	20
60	Masks + Cohorts	Equal	Elementary student	1.4 (-1, 3.8)	1	5
60	Masks + Cohorts	Half	Elementary student	1.7 (-1.9, 4.6)	1.2	7
60	Masks + Cohorts		Middle school student	0.8 (-0.9, 2.7)	0.7	6
60	Masks + Cohorts		High school student	1.3 (-3.5, 4.4)	0.9	
60	Masks + Cohorts	Equal	Elementary teacher	0.4 (-2.7, 3.5)	0	
60	Masks + Cohorts	Half	Elementary teacher	0.5 (-4.7, 6.5)	0	
60	Masks + Cohorts		Middle school teacher	0.6 (-3.9, 5.6)	0	
60	Masks + Cohorts		High school teacher	49.2 (19.4, 84)	32.7	187
70	None	Equal	Elementary student	23.4 (6.1, 48.8)	20.7	89
70	None	Half	Elementary student	35.3 (7.7, 70.9)	23.9	148
70	None		Middle school student	25 (1.1, 51.8)	20.6	170
70	None		High school student	20.2 (4.2, 38.5)	15.8	
70	None	Equal	Elementary teacher	11 (0, 23.9)	9.2	
70	None	Half	Elementary teacher	20.8 (0, 48.9)	13.5	
70	None		Middle school teacher	16.6 (0, 42.6)	10.8	
70	None		High school teacher	25.7 (-0.1, 57)	16.3	98
70	Masks	Equal	Elementary student	5.9 (-0.6, 14.1)	4.2	22
70	Masks	Half	Elementary student	9.3 (-1, 27.7)	4.5	39
70	Masks		Middle school student	2.9 (-0.5, 6.9)	2.3	20
70	Masks		High school student	6.5 (0, 15.4)	5.3	
70	Masks	Equal	Elementary teacher	1.9 (-1.8, 5.9)	1.7	
70	Masks	Half	Elementary teacher	3.1 (-2.3, 11.4)	2.2	
70	Masks		Middle school teacher	1.5 (-2.1, 6.1)	1.8	
70	Masks		High school teacher	15.2 (-1.3, 41.7)	9.4	58
70	Masks + Testing	Equal	Elementary student	2.3 (-0.9, 6.1)	1.2	9
70	Masks + Testing	Half	Elementary student	3.7 (-1.5, 10.1)	1.4	15
70	Masks + Testing		Middle school student	1.3 (-0.8, 3.7)	0.8	9
70	Masks + Testing		High school student	3.7 (-2.7, 10.3)	2.6	
70	Masks + Testing	Equal	Elementary teacher	0.7 (-1.8, 3.5)	0.8	
70	Masks + Testing	Half	Elementary teacher	1.3 (-2.3, 6.8)	0	
70	Masks + Testing		Middle school teacher	0.6 (-3.8, 3.8)	0	
70	Masks + Testing		High school teacher	4.1 (-0.9, 10.3)	2.4	15

70	Masks + Cohorts	Equal	Elementary student	1 (-0.7, 2.8)	0.7	4
70	Masks + Cohorts	Half	Elementary student	1.2 (-1.1, 3.6)	0.7	5
70	Masks + Cohorts		Middle school student	0.5 (-0.7, 1.8)	0.4	4
70	Masks + Cohorts		High school student	0.9 (-1.8, 3.6)	0.9	
70	Masks + Cohorts	Equal	Elementary teacher	0.2 (-1.8, 3.4)	0	
70	Masks + Cohorts	Half	Elementary teacher	0.3 (-2.4, 4.7)	0	
70	Masks + Cohorts		Middle school teacher	0.2 (-3.8, 3.8)	0	
70	Masks + Cohorts		High school teacher	56.2 (30.9, 85.3)	41.1	214

*Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

Table S13. Excess hospitalizations attributable to school transmission using parameters specified in Table S1. Results are stratified by levels of community vaccination coverage and within-school non-pharmaceutical intervention (NPI). M/T = masks + testing; M/C = masks + cohorts.

NPI	Susceptibility of children <10 years	Population	50% coverage		60% coverage		70% coverage	
			Mean (89% HPDI) excess hospitalizations per 100,00 population	Median excess hospitalizations per 100,00 population	Mean (89% HPDI) excess hospitalizations per 100,00 population	Median excess hospitalizations per 100,00 population	Mean (89% HPDI) excess hospitalizations per 100,00 population	Median excess hospitalizations per 100,00 population
None	Equal	Elementary student	8.9, (0, 32)	0	6.4, (0, 21.6)	0	4.2, (0, 20.6)	0
None	Half	Elementary student	7.9, (0, 32.5)	0	4.7, (0, 21.7)	0	3.2, (0, 11.2)	0
None		Middle school student	7.5, (0, 41.5)	0	4.9, (0, 21.7)	0	3.2, (0, 20.8)	0
None		High school student	7.7, (0, 32.7)	0	5.2, (0, 30.5)	0	2.8, (0, 16.1)	0
None	Equal	Elementary teacher	54.1, (0, 175.4)	0	43, (0, 170.9)	0	31, (0, 88.5)	0
None	Half	Elementary teacher	40.6, (0, 172.4)	0	29.2, (0, 88.5)	0	17.3, (0, 87.7)	0
None		Middle school teacher	64.6, (0, 232.6)	0	50.9, (0, 222.2)	0	29.5, (0, 217.4)	0
None		High school teacher	55.8, (0, 196.1)	0	53.3, (0, 192.3)	0	26, (0, 185.2)	0
Masks	Equal	Elementary student	3.8, (0, 31.2)	0	2.6, (0, 20.3)	0	1.3, (0, 10.8)	0
Masks	Half	Elementary student	1.7, (-11.4, 18.5)	0	1.1, (0, 20.3)	0	0.7, (0, 10.4)	0
Masks		Middle school student	1.9, (0, 41)	0	1.6, (0, 20.7)	0	0.9, (0, 0)	0
Masks		High school student	2, (-16.2, 16)	0	1.9, (0, 16.9)	0	0.7, (0, 15.3)	0
Masks	Equal	Elementary teacher	22.3, (0, 89.3)	0	17.1, (0, 87.7)	0	11.6, (0, 86.2)	0
Masks	Half	Elementary teacher	12.1, (0, 89.3)	0	7.7, (0, 86.2)	0	3.9, (0, 82.6)	0
Masks		Middle school teacher	14.4, (0, 217.4)	0	9.6, (0, 0)	0	2.3, (0, 0)	0
Masks		High school teacher	10.2, (0, 185.2)	0	6.1, (0, 0)	0	0.2, (0, 0)	0
M/T	Equal	Elementary student	2.6, (-10.9, 19.9)	0	1.5, (0, 11)	0	0.9, (0, 10.5)	0
M/T	Half	Elementary student	0.7, (-11.1, 11.1)	0	0.3, (0, 20.8)	0	0.3, (0, 10)	0
M/T		Middle school student	1.6, (0, 22.7)	0	0.7, (0, 20.5)	0	0.6, (0, 0)	0
M/T		High school student	1.2, (-15.9, 16.1)	0	0.4, (-16.2, 0)	0	0.3, (0, 0)	0
M/T	Equal	Elementary teacher	16, (0, 88.5)	0	10.1, (0, 86.2)	0	4.7, (0, 0)	0
M/T	Half	Elementary teacher	5.4, (0, 87.7)	0	3.8, (-84.7, 0)	0	0.9, (0, 0)	0
M/T		Middle school teacher	8.8, (-217.4, 0)	0	7.7, (0, 0)	0	1.9, (0, 0)	0
M/T		High school teacher	1.8, (0, 0)	0	3.4, (0, 0)	0	-2.8, (0, 0)	0
M/C	Equal	Elementary student	0.8, (-10.8, 10.8)	0	0.7, (0, 10.9)	0	0.2, (0, 10.3)	0
M/C	Half	Elementary student	0.1, (-10.7, 10.6)	0	-0.1, (-10.4, 10.5)	0	0.2, (0, 10.1)	0
M/C		Middle school student	0.1, (0, 22.8)	0	0, (-19.3, 0)	0	0.5, (0, 0)	0

M/C		High school student	0·4, (-15·9, 16·2)	0	0·5, (0, 16·1)	0	0·3, (0, 0)	0
M/C	Equal	Elementary teacher	9·6 (0, 89·3)	0	6·5 (0, 87·7)	0	2·1 (0, 0)	0
M/C	Half	Elementary teacher	7 (0, 87·7)	0	1·9 (-86·2, 0)	0	1 (0, 0)	0
M/C		Middle school teacher	4·6 (0, 0)	0	4·4 (0, 0)	0	5·1 (0, 0)	0
M/C		High school teacher	3·5 (-185·2, 0)	0	2·1 (0, 0)	0	0·8 (0, 0)	0

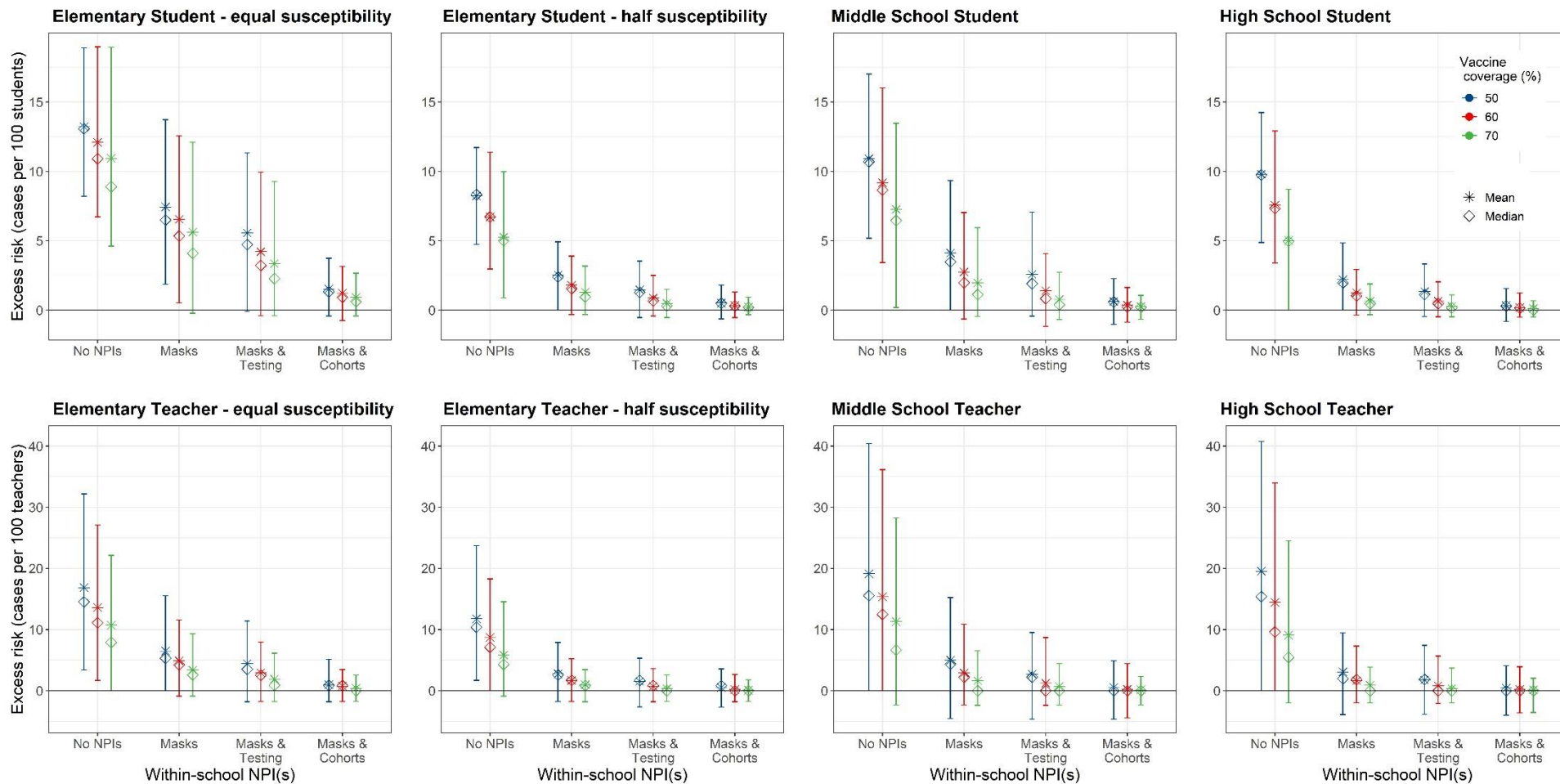


Figure S2. Effect of non-pharmaceutical interventions under lower infectiousness of asymptomatic carriers ($\alpha=0.3$). We examined the effect of three non-pharmaceutical interventions across three levels of community vaccination coverage (50%, 60%, 70%), assuming that vaccination coverage within school children 12+ and teachers matches that in the community and the vaccine effectiveness is 77% against infection, 85% against symptomatic infection, and 93% against severe infection. Here, the relative infectiousness of asymptomatic carriers is set at 0.3, rather than 0.5, as in the text. Masks indicate universal masks regardless of vaccination status. We calculated the mean (stars) and median (diamonds) of excess cases per 100 persons attributable to school transmission among population subgroups across 1,000 model realizations. Vertical lines reflect the 89th percentile high probability density interval (HPDI).

Supplemental results for Alpha variant

Effect of within-school precautions under various community vaccination coverages – Alpha variant

Table S14. Excess symptomatic infections attributable to school transmission assuming circulation of the Alpha variant only. Results are stratified by levels of community vaccination coverage and within-school non-pharmaceutical intervention (NPI).

NPI	Susceptibility of children <10 years	Population	50% coverage		60% coverage		70% coverage	
			Mean (89% HPDI) excess infections per 100 population	Median excess infections per 100 population	Mean (89% HPDI) excess infections per 100 population	Median excess infections per 100 population	Mean (89% HPDI) excess infections per 100 population	Median excess infections per 100 population
None	Equal	Elementary student	2.4 (-0.2, 6.9)	1.4	1.8 (-0.2, 5.5)	0.7	1.3 (-0.2, 4.3)	0.2
None	Half	Elementary student	0.5 (-0.2, 1.2)	0.2	0.3 (-0.1, 1)	0.1	0.2 (-0.1, 0.7)	0
None		Middle school student	2.4 (-0.2, 7.9)	0.6	1.4 (-0.2, 5.4)	0	0.8 (-0.2, 3)	0
None		High school student	1 (-0.2, 3.6)	0.2	0.3 (-0.2, 1)	0	0.1 (0, 0.3)	0
None	Equal	Elementary teacher	2.8 (-0.9, 8.4)	1.7	1.8 (-0.9, 6.7)	0.9	1 (-0.9, 4.3)	0
None	Half	Elementary teacher	0.8 (-1.8, 2.7)	0.8	0.4 (-0.9, 2.6)	0	0.2 (-0.9, 1.7)	0
None		Middle school teacher	4.1 (-2.4, 14.9)	0	2 (-2.3, 8.9)	0	0.9 (-2.3, 4.4)	0
None		High school teacher	2.4 (-2, 9.4)	0	0.7 (-2, 3.8)	0	0.2 (-1.9, 1.9)	0
Masks	Equal	Elementary student	0.5 (-0.2, 1.6)	0.2	0.4 (-0.2, 1.1)	0.1	0.3 (-0.2, 0.9)	0
Masks	Half	Elementary student	0.1 (-0.1, 0.3)	0	0.1 (-0.1, 0.3)	0	0.1 (-0.1, 0.2)	0
Masks		Middle school student	0.2 (-0.3, 0.7)	0	0.1 (-0.2, 0.4)	0	0.1 (0, 0.4)	0
Masks		High school student	0.1 (-0.2, 0.3)	0	0 (0, 0.3)	0	0 (0, 0.2)	0
Masks	Equal	Elementary teacher	0.4 (-0.9, 2.5)	0	0.2 (-0.9, 1.8)	0	0.1 (-0.9, 1.7)	0
Masks	Half	Elementary teacher	0.1 (-0.9, 1.8)	0	0.1 (-0.9, 1.7)	0	0 (-0.9, 0.9)	0
Masks		Middle school teacher	0.3 (-2.3, 2.3)	0	0 (-2.3, 2.2)	0	0.1 (-2.3, 2.2)	0
Masks		High school teacher	0.1 (-2, 1.9)	0	0 (-1.9, 1.9)	0	0 (-1.9, 1.9)	0

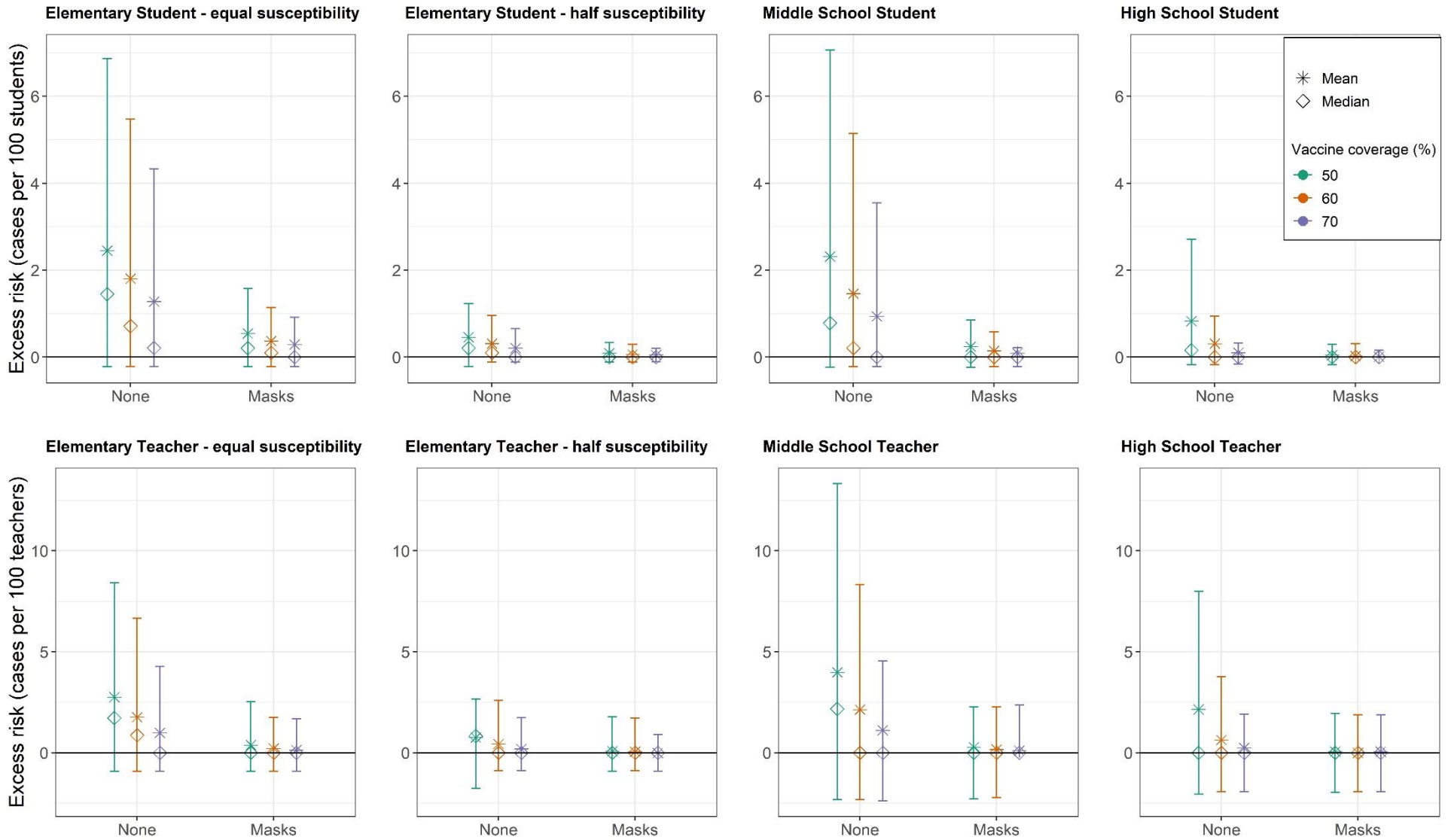


Figure S3. We examined the effect of masks across three levels of community vaccination coverage (50%, 60%, 70%), assuming circulation of the Alpha variant only, and that the vaccine effectiveness is 85% against symptomatic infection. We examined the results across two assumptions about the susceptibility of children (children <10 half as susceptible to SARS-CoV-2 as those 10+ vs. equally susceptible across all ages). We calculated the mean (stars) and median (diamonds) of excess cases per 100 persons attributable to school transmission among population subgroups across 1,000 model realizations. Vertical lines reflect the 89th percentile high probability density interval (HPDI).

Interventions required to reduce incidence attributable within schools below certain risk thresholds – Alpha variant

Table S15. The minimum non-pharmaceutical intervention(s), or minimum within-school vaccination coverage of the eligible population, needed to reduce the risk of symptomatic infection to beneath a given threshold (e.g., 50 cases per 1,000 population), assuming that 70% of the vaccine-eligible community has received a vaccine at 85% effectiveness. Simulations examine circulation of the Alpha variant alone.

		Threshold - symptomatic cases per 1,000 population				< 1 case per school**
		<50	<10	<5	<1	
Students	Elementary school – equal susceptibility	70% within-school coverage	Masks	Masks	Masks + cohorts	Masks
	Elementary school – half susceptibility	70% within-school coverage	70% within-school coverage	Masks or 85% within-school coverage	Masks	Masks
	Middle school	70% within-school coverage	70% within-school coverage	Masks or 95% within-school coverage	Masks	Masks
	High school	70% within-school coverage	70% within-school coverage	70% within-school coverage	Masks or 75% within-school coverage	70% within-school coverage
Teachers	Elementary school – equal susceptibility	70% within-school coverage	70% within-school coverage	Masks or 90% within-school coverage	Masks	
	Elementary school – half susceptibility	70% within-school coverage	70% within-school coverage	70% within-school coverage	Masks or 85% within-school coverage	
	Middle school	70% within-school coverage	70% within-school coverage	Masks or 90% VC	Masks	
	High school	70% within-school coverage	70% within-school coverage	70% within-school coverage	Masks or 85% within-school coverage	

*not observed under the specific combination of interventions simulated

**Assuming a 380-person elementary school, 420-person middle school, and 680-person high school

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