

Supplementary Information

Effective approaches to disaster evacuation during a COVID-like pandemic

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Susceptible-Exposed-Infectious-Recovered (SEIR) scenario simulations

We ran the SEIR simulations for evacuation scenarios with different seeding cases, vaccine uptake levels, and evacuation strategies. In addition, we included the number of mild and severe infections when the pandemic peaks occurred on the N -th day after evacuees went to a congregate shelter. In the following tables, this research records N in the *days* columns and shows the number of infections in the *infections* columns. Note that rather than rounding up the number of infections, we used the exact values of infections to show a more subtle indication of the risks of COVID-19 infections at the congregate shelter.

1. Mild infections

Supplementary Table S1: Mild infections with seeding cases = 5, sufficient vaccine uptake in the Taoyuan District.

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	43	11.55548	23	28.30529	15	40.87655	10	45.15833
No Diversion, AZ	32	5.967614	25	22.49572	17	38.03253	13	44.51789
No Diversion, Moderna	29	4.191649	25	20.32089	18	36.04572	14	43.57942
Diversion Scenario 1, Without Vaccination	365	0	365	0	24	29.4373	15	33.33842
Diversion Scenario 1, AZ	365	0	365	0	365	0	19	31.02281
Diversion Scenario 1, Moderna	365	0	365	0	365	0	22	26.80247
Diversion Scenario 2, Without Vaccination	365	0	38	21.12473	17	33.36186	12	36.86447
Diversion Scenario 2, AZ	365	0	365	0	22	28.71021	15	36.02019
Diversion Scenario 2, Moderna	365	0	365	0	23	24.54191	16	34.76828
Diversion Scenario 3, Without Vaccination	40	10.73476	22	26.07571	14	37.48921	9	41.44809
Diversion Scenario 3, AZ	29	5.809066	23	21.13372	16	34.63651	12	39.93944
Diversion Scenario 3, Moderna	28	3.921995	23	19.10971	17	32.92009	13	39.36013

Supplementary Table S2: Mild infections with seeding cases = 10, sufficient vaccine uptake in the Taoyuan District.

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	34	12.46726	19	28.55487	13	37.70962	10	37.64235
No Diversion, AZ	28	7.914423	21	24.5398	15	35.57793	12	37.04003
No Diversion, Moderna	26	6.692919	21	22.22493	16	33.82004	13	36.42773
Diversion Scenario 1, Without Vaccination	365	0	365	0	21	25.82964	15	25.28324
Diversion Scenario 1, AZ	365	0	365	0	32	14.276	19	23.06586
Diversion Scenario 1, Moderna	365	0	365	0	365	0	23	17.9997
Diversion Scenario 2, Without Vaccination	365	0	26	21.35567	15	29.86452	11	28.87851
Diversion Scenario 2, AZ	365	0	32	10.90713	18	26.99929	14	28.36496
Diversion Scenario 2, Moderna	365	0	36	1.95777	20	24.0717	15	27.25621
Diversion Scenario 3, Without Vaccination	33	11.51072	18	26.27071	11	34.23858	8	33.87069
Diversion Scenario 3, AZ	26	7.332497	19	22.60394	14	32.19834	11	32.69077
Diversion Scenario 3, Moderna	25	6.222208	20	20.59615	15	30.65252	12	31.87635

Supplementary Table S3: Mild infections with seeding cases = 5, limited vaccine uptake in the Taoyuan District.

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	43	11.46991	23	28.17548	15	41.27541	11	45.75635
No Diversion, AZ	41	10.00172	24	27.37671	15	40.37793	11	45.50858
No Diversion, Moderna	40	9.438807	24	26.86349	15	40.41179	11	44.76203
Diversion Scenario 1, Without Vaccination	365	0	365	0	25	29.80297	15	33.72192
Diversion Scenario 1, AZ	365	0	365	0	26	28.09626	15	33.28046
Diversion Scenario 1, Moderna	365	0	365	0	28	27.00151	16	32.72111

Diversion Scenario 2, Without Vaccination	365	0	39	21.09182	18	33.7766	12	37.26141
Diversion Scenario 2, AZ	365	0	43	17.91903	18	32.86558	12	36.60806
Diversion Scenario 2, Moderna	365	0	49	15.01087	19	32.51132	13	36.06787
Diversion Scenario 3, Without Vaccination	41	10.62009	22	26.07843	14	37.90752	9	41.77548
Diversion Scenario 3, AZ	38	9.359475	23	25.05724	14	37.16168	10	41.20307
Diversion Scenario 3, Moderna	39	8.412866	23	24.58922	15	36.65467	10	40.5868

Supplementary Table S4: Mild infections with seeding cases = 10, limited vaccine uptake in the Taoyuan District.

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	34	12.59583	19	28.43501	13	37.49543	10	36.58514
No Diversion, AZ	32	11.72861	19	27.85182	13	36.66462	10	36.48952
No Diversion, Moderna	32	11.17903	19	27.54417	13	37.05205	10	36.75298
Diversion Scenario 1, Without Vaccination	365	0	365	0	21	25.76914	15	24.15233
Diversion Scenario 1, AZ	365	0	365	0	22	24.42506	16	24.38423
Diversion Scenario 1, Moderna	365	0	365	0	23	24.44382	16	24.42277
Diversion Scenario 2, Without Vaccination	365	0	26	21.31495	15	29.80773	11	27.75174
Diversion Scenario 2, AZ	365	0	27	20.08429	15	28.93205	12	27.96653
Diversion Scenario 2, Moderna	365	0	28	19.26873	16	29.02328	12	28.25556
Diversion Scenario 3, Without Vaccination	31	11.82065	17	26.24904	11	34.342	8	32.68675
Diversion Scenario 3, AZ	30	10.96787	18	25.69033	12	33.36025	8	32.76173
Diversion Scenario 3, Moderna	30	10.47972	18	25.18594	12	33.75534	9	32.92327

Supplementary Table S5: Mild infections with seeding cases = 5, sufficient vaccine uptake in the Jiaxian District.

R₀ (basic reproduction number)	1.5		2		2.5		3	
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	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	39	7.59	21	18.97177	15	27.57253	11	30.76984
No Diversion, AZ	29	4.632966	23	15.51762	17	25.28455	13	30.02215
No Diversion, Moderna	28	3.496007	23	13.99449	17	24.42709	14	29.05335
Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	22	19.49448
Diversion Scenario 1, AZ	365	0	365	0	365	0	365	0
Diversion Scenario 1, Moderna	365	0	365	0	365	0	365	0
Diversion Scenario 2, Without Vaccination	365	0	365	0	19	20.5539	14	23.04111
Diversion Scenario 2, AZ	365	0	365	0	24	16.09303	17	21.9717
Diversion Scenario 2, Moderna	365	0	365	0	28	11.47917	19	20.1952
Diversion Scenario 3, Without Vaccination	37	6.928982	20	17.16084	13	24.76313	10	27.50231
Diversion Scenario 3, AZ	28	4.132037	22	14.09956	15	22.65366	12	26.58401
Diversion Scenario 3, Moderna	27	2.794991	22	12.73955	16	21.83313	13	25.70199

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49 **Supplementary Table S6: Mild infections with seeding cases = 10, sufficient vaccine uptake**
50 **in the Jiaxian District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	30	8.418284	18	18.56844	13	25.13988	11	25.37028
No Diversion, AZ	27	5.312316	20	15.98738	15	23.3177	13	25.58039
No Diversion, Moderna	25	4.716436	20	15.0014	16	22.17189	14	24.70432
Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	365	0
Diversion Scenario 1, AZ	365	0	365	0	365	0	365	0
Diversion Scenario 1, Moderna	365	0	365	0	365	0	365	0
Diversion Scenario 2, Without Vaccination	365	0	34	11.91876	18	18.0152	15	17.73715
Diversion Scenario 2, AZ	365	0	365	0	23	14.25209	17	17.38019
Diversion Scenario 2, Moderna	365	0	365	0	25	10.78023	19	15.36978
Diversion Scenario 3, Without Vaccination	28	7.73036	17	16.88038	11	22.55365	9	22.17882

Diversion Scenario 3, AZ	25	4.848064	19	14.61734	14	20.65694	12	22.00071
Diversion Scenario 3, Moderna	23	4.38501	19	13.58266	15	19.35601	13	21.21627

Supplementary Table S7: Mild infections with seeding cases = 5, limited vaccine uptake in the Jiaxian District.

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	38	7.701176	23	18.66291	14	27.29267	11	30.7891
No Diversion, AZ	37	6.706969	22	18.2694	15	27.44431	12	30.11654
No Diversion, Moderna	35	6.62881	23	17.95912	15	27.08177	12	29.91209
Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	22	19.56954
Diversion Scenario 1, AZ	365	0	365	0	365	0	24	18.35837
Diversion Scenario 1, Moderna	365	0	365	0	365	0	25	17.75045
Diversion Scenario 2, Without Vaccination	365	0	365	0	19	20.16456	14	23.07836
Diversion Scenario 2, AZ	365	0	365	0	21	20.09412	15	22.37533
Diversion Scenario 2, Moderna	365	0	365	0	21	19.50684	15	22.16913
Diversion Scenario 3, Without Vaccination	37	6.96938	21	17.08948	13	24.60763	9	27.41943
Diversion Scenario 3, AZ	35	6.081868	20	16.7911	14	24.71003	10	26.8383
Diversion Scenario 3, Moderna	34	6.001605	22	16.00272	14	24.13736	10	26.48924

Supplementary Table S8: Mild infections with seeding cases = 10, limited vaccine uptake in the Jiaxian District.

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	30	8.414598	18	18.74871	13	24.74799	11	26.06537
No Diversion, AZ	31	7.545015	19	18.30475	14	24.8238	12	26.04874
No Diversion, Moderna	29	7.545917	18	18.21399	14	23.86213	12	25.86234
Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	365	0

Diversion Scenario 1, AZ	365	0	365	0	365	0	365	0
Diversion Scenario 1, Moderna	365	0	365	0	365	0	365	0
Diversion Scenario 2, Without Vaccination	365	0	34	11.99391	18	17.53487	14	18.37603
Diversion Scenario 2, AZ	365	0	37	10.45099	19	17.58533	15	18.39845
Diversion Scenario 2, Moderna	365	0	37	9.639751	19	16.54344	15	18.14068
Diversion Scenario 3, Without Vaccination	28	7.735346	17	17.00817	11	22.16123	9	22.81624
Diversion Scenario 3, AZ	29	6.97081	17	16.72106	12	22.14558	10	22.63498
Diversion Scenario 3, Moderna	27	6.933703	17	16.4423	12	21.31563	10	22.52813

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59 2. Severe infections

60 **Supplementary Table S9: Severe infections with seeding cases = 5, sufficient vaccine uptake**
61 **in the Taoyuan District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	47	0.3247625	26	0.8306739	16	1.239378	12	1.413427
No Diversion, AZ	29	0.1328417	26	0.5566801	18	1.062406	14	1.325785
No Diversion, Moderna	28	0.09912031	26	0.5203186	20	1.010357	15	1.284653
Diversion Scenario 1, Without Vaccination	365	0	365	0	28	0.9263669	17	1.047115
Diversion Scenario 1, AZ	365	0	365	0	365	0	21	0.8450511
Diversion Scenario 1, Moderna	365	0	365	0	365	0	24	0.7240891
Diversion Scenario 2, Without Vaccination	365	0	42	0.649586	20	1.013991	14	1.156995
Diversion Scenario 2, AZ	365	0	365	0	23	0.7574753	16	1.046938
Diversion Scenario 2, Moderna	365	0	365	0	25	0.6478018	18	0.9999644
Diversion Scenario 3, Without Vaccination	45	0.3020935	25	0.767327	15	1.144847	11	1.3007
Diversion Scenario 3, AZ	27	0.1312273	24	0.5309122	17	0.9693345	13	1.192235
Diversion Scenario 3, Moderna	27	0.09247595	24	0.4931194	19	0.9210515	15	1.171755

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63 **Supplementary Table S10: Severe infections with seeding cases = 10, sufficient vaccine**
64 **uptake in the Taoyuan District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	38	0.3454165	21	0.831271	14	1.159828	11	1.183036
No Diversion, AZ	25	0.185183	21	0.6431123	16	1.013522	13	1.105489
No Diversion, Moderna	24	0.1639151	22	0.5828502	17	0.9567095	14	1.07922
Diversion Scenario 1, Without Vaccination	365	0	365	0	24	0.803641	18	0.7954026
Diversion Scenario 1, AZ	365	0	365	0	31	0.2894057	20	0.5922712
Diversion Scenario 1, Moderna	365	0	365	0	365	0	24	0.4502648
Diversion Scenario 2, Without Vaccination	365	0	30	0.6312546	17	0.911071	13	0.9048079
Diversion Scenario 2, AZ	365	0	31	0.2283995	19	0.7276179	15	0.8103612
Diversion Scenario 2, Moderna	365	0	36	0.04081423	21	0.6394542	16	0.7686734
Diversion Scenario 3, Without Vaccination	37	0.3165338	19	0.7674277	12	1.054497	10	1.048916
Diversion Scenario 3, AZ	23	0.1729834	19	0.5937986	14	0.9256116	11	0.9885383
Diversion Scenario 3, Moderna	21	0.1540614	21	0.5425588	15	0.8740455	13	0.9491183

65 **Supplementary Table S11: Severe infections with seeding cases = 5, limited vaccine uptake**
66 **in the Taoyuan District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	48	0.3245337	26	0.8224692	17	1.260232	12	1.43475
No Diversion, AZ	43	0.2625229	26	0.7835472	17	1.204372	13	1.417978
No Diversion, Moderna	43	0.2529976	27	0.7750999	18	1.22303	13	1.39472
Diversion Scenario 1, Without Vaccination	365	0	365	0	28	0.9491791	18	1.056416
Diversion Scenario 1, AZ	365	0	365	0	30	0.8530609	18	1.031604
Diversion Scenario 1, Moderna	365	0	365	0	31	0.8230788	18	1.015605
Diversion Scenario 2, Without Vaccination	365	0	43	0.6470409	20	1.036342	14	1.16703
Diversion Scenario 2, AZ	365	0	46	0.5097703	21	0.9849764	13	1.132851
Diversion Scenario 2, Moderna	365	0	53	0.4330797	21	0.9810313	14	1.113242

Diversion Scenario 3, Without Vaccination	46	0.3000448	25	0.7667126	16	1.161063	11	1.314857
Diversion Scenario 3, AZ	41	0.2458966	25	0.7107022	16	1.123329	11	1.284912
Diversion Scenario 3, Moderna	42	0.2219356	26	0.7023498	16	1.098205	11	1.274857

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68 **Supplementary Table S12: Severe infections with seeding cases = 10, limited vaccine uptake**
69 **in the Taoyuan District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	37	0.3485753	21	0.8243679	13	1.156723	11	1.158859
No Diversion, AZ	34	0.3111273	21	0.7954734	14	1.114013	11	1.145071
No Diversion, Moderna	34	0.2986311	21	0.7960333	15	1.123378	11	1.1513
Diversion Scenario 1, Without Vaccination	365	0	365	0	24	0.7957384	18	0.7596096
Diversion Scenario 1, AZ	365	0	365	0	25	0.7242575	18	0.7470191
Diversion Scenario 1, Moderna	365	0	365	0	26	0.7352232	19	0.7486393
Diversion Scenario 2, Without Vaccination	365	0	30	0.631071	17	0.9061185	13	0.8692585
Diversion Scenario 2, AZ	365	0	30	0.5700082	17	0.8676757	13	0.866626
Diversion Scenario 2, Moderna	365	0	31	0.5509471	18	0.8592801	14	0.8757513
Diversion Scenario 3, Without Vaccination	35	0.3286046	19	0.7683779	12	1.06751	9	1.024384
Diversion Scenario 3, AZ	32	0.2905216	19	0.7369	12	1.031765	10	1.010638
Diversion Scenario 3, Moderna	32	0.2797493	20	0.7226324	13	1.031791	10	1.039598

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71 **Supplementary Table S13: Severe infections with seeding cases = 5, sufficient vaccine**
72 **uptake in the Jiaxian District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	43	0.3295869	26	0.8970851	19	1.358521	16	1.557099
No Diversion, AZ	28	0.1584508	25	0.6130182	19	1.128077	17	1.427195
No Diversion, Moderna	28	0.124109	26	0.5615487	20	1.105325	18	1.380476

Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	26	1.061874
Diversion Scenario 1, AZ	365	0	365	0	365	0	365	0
Diversion Scenario 1, Moderna	365	0	365	0	365	0	365	0
Diversion Scenario 2, Without Vaccination	365	0	365	0	24	1.051948	18	1.211635
Diversion Scenario 2, AZ	365	0	365	0	26	0.635864	20	0.9959775
Diversion Scenario 2, Moderna	365	0	365	0	30	0.4396523	21	0.9053833
Diversion Scenario 3, Without Vaccination	41	0.3005126	25	0.806261	18	1.206881	15	1.346312
Diversion Scenario 3, AZ	26	0.1398073	23	0.5539764	18	1.003458	16	1.246961
Diversion Scenario 3, Moderna	26	0.09735456	24	0.5072378	19	0.9760466	17	1.21091

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74 **Supplementary Table S14: Severe infections with seeding cases = 10, sufficient vaccine**
75 **uptake in the Jiaxian District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	35	0.3611021	23	0.8628452	18	1.223469	16	1.278829
No Diversion, AZ	26	0.1852406	22	0.6436089	18	1.037049	16	1.203183
No Diversion, Moderna	25	0.1711611	22	0.6147996	19	0.9904346	17	1.162252
Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	365	0
Diversion Scenario 1, AZ	365	0	365	0	365	0	365	0
Diversion Scenario 1, Moderna	365	0	365	0	365	0	365	0
Diversion Scenario 2, Without Vaccination	365	0	38	0.5760249	22	0.9099442	19	0.936535
Diversion Scenario 2, AZ	365	0	365	0	24	0.5522291	19	0.7606005
Diversion Scenario 2, Moderna	365	0	365	0	27	0.4117506	21	0.6584527
Diversion Scenario 3, Without Vaccination	33	0.3304723	21	0.7808564	17	1.085806	15	1.075823
Diversion Scenario 3, AZ	24	0.1685301	20	0.5893181	17	0.9083089	15	1.016676
Diversion Scenario 3, Moderna	23	0.1588804	21	0.5527794	18	0.8457714	16	0.9865946

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77 **Supplementary Table S15: Severe infections with seeding cases = 5, limited vaccine uptake**
78 **in the Jiaxian District.**

R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	42	0.3336079	27	0.8785806	19	1.353368	16	1.559286
No Diversion, AZ	40	0.2714487	26	0.8298279	19	1.331347	16	1.501585
No Diversion, Moderna	39	0.2724887	27	0.8272712	19	1.322606	16	1.493646
Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	26	1.06505
Diversion Scenario 1, AZ	365	0	365	0	365	0	28	0.9363946
Diversion Scenario 1, Moderna	365	0	365	0	365	0	29	0.9179857
Diversion Scenario 2, Without Vaccination	365	0	365	0	24	1.019414	18	1.205996
Diversion Scenario 2, AZ	365	0	365	0	25	0.9815352	19	1.134537
Diversion Scenario 2, Moderna	365	0	365	0	25	0.9547657	19	1.13743
Diversion Scenario 3, Without Vaccination	41	0.3010038	25	0.8066417	18	1.196347	15	1.35122
Diversion Scenario 3, AZ	38	0.2443132	24	0.7666464	18	1.196919	15	1.3021
Diversion Scenario 3, Moderna	37	0.2452921	26	0.7265651	18	1.154408	15	1.2954

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80 **Supplementary Table S16: Severe infections with seeding cases = 10, limited vaccine uptake**
81 **in the Jiaxian District.**

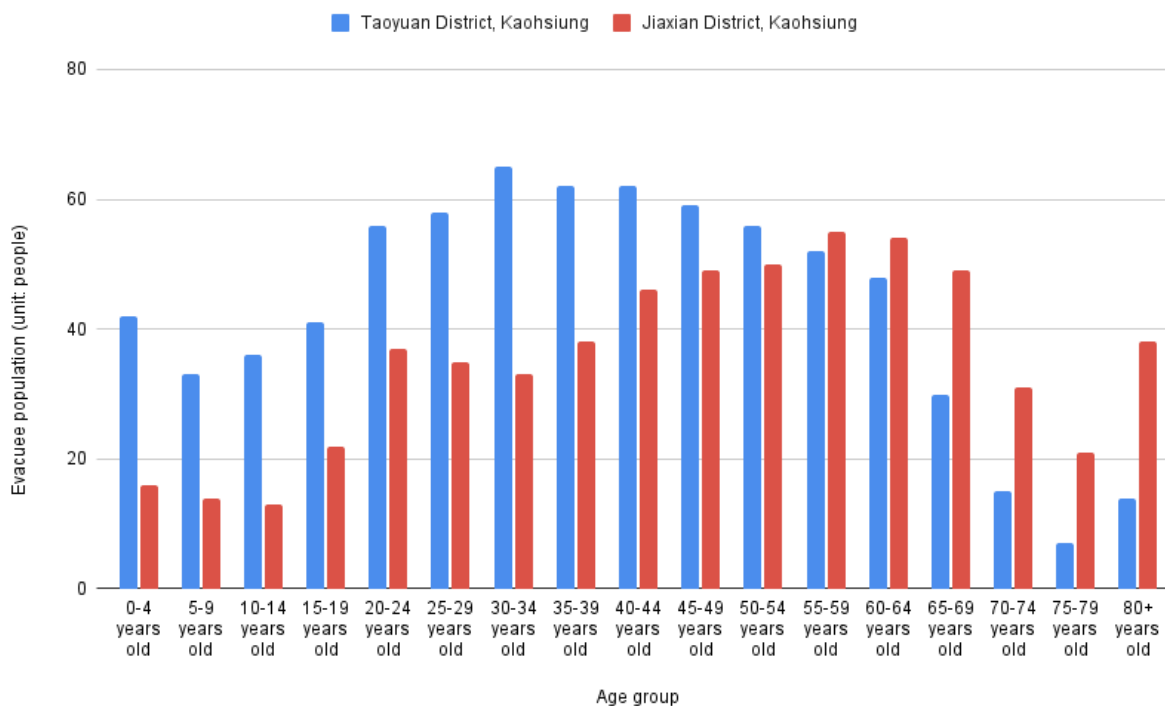
R₀ (basic reproduction number)	1.5		2		2.5		3	
	days	infections	days	infections	days	infections	days	infections
No Diversion, Without Vaccination	35	0.3609765	23	0.8762037	18	1.205037	16	1.309477
No Diversion, AZ	34	0.3063992	23	0.8275815	18	1.187144	16	1.299311
No Diversion, Moderna	33	0.3107383	22	0.8357185	18	1.145404	16	1.296523
Diversion Scenario 1, Without Vaccination	365	0	365	0	365	0	365	0
Diversion Scenario 1, AZ	365	0	365	0	365	0	365	0
Diversion Scenario 1, Moderna	365	0	365	0	365	0	365	0
Diversion Scenario 2, Without Vaccination	365	0	38	0.5805339	23	0.8830549	19	0.9658407

Diversion Scenario 2, AZ	365	0	41	0.4603188	23	0.8559943	19	0.9385393
Diversion Scenario 2, Moderna	365	0	41	0.4321959	23	0.8088664	19	0.9246718
Diversion Scenario 3, Without Vaccination	33	0.3302846	21	0.7881739	16	1.062474	15	1.10721
Diversion Scenario 3, AZ	32	0.2823202	21	0.7551148	17	1.047436	15	1.089197
Diversion Scenario 3, Moderna	31	0.2840194	21	0.7456544	17	1.013668	15	1.088567

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84 Evacuees' age distribution



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Supplementary Fig. S1: The evacuees' age distribution in the Taoyuan District and the Jiaxian District of Kaohsiung City, Taiwan. The x-axis shows the age distribution, ranging from 0 to older than 80 years old, is divided into five-year age groups. The y-axis indicates the number of evacuees in a five-year age group, which is derived by the product of the number of evacuees in a district and the ratio of the original every five-year age group among total population²⁵ in that district. Although the actual age distribution of evacuees in the Taoyuan District and the Jiaxian District were not publicly available due to personal data privacy regulation in Taiwan, we can still use the proxy age distribution to deduce the impacts of different types of evacuees' age distributions on the evolution of the COVID-19 pandemic.