Methods and Results

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Methods

Data analysis

Results

Q1: Proportion of asymptomatic cases

We included 86 studies that reported empirical data about 15,952 people with SARS-CoV-2 infection (4,350 defined as having asymptomatic infection).

Q2.1: Secondary attack rate from asymptomatic and presymptomatic cases

Q2.2: Proportion of transmission from asymptomatic or pre-symptomatic infections

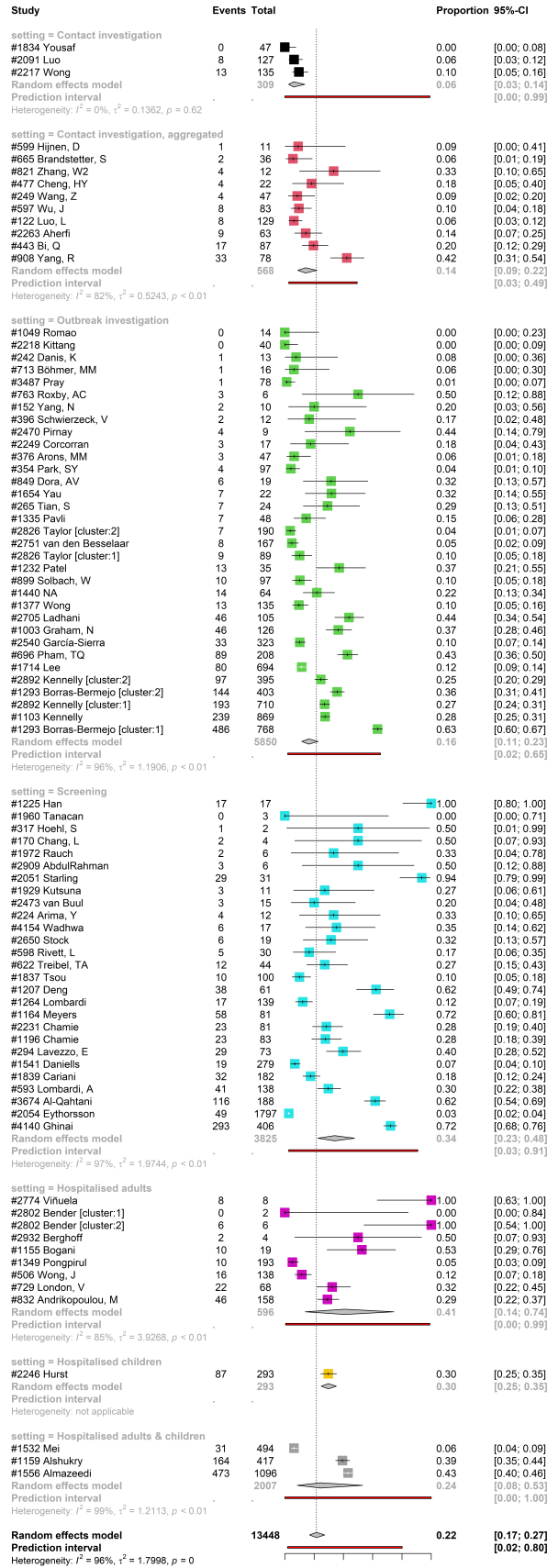| Study	Events	Total	Proportion	95%-CI
setting = Contact investigation				
#1834 Yousaf	0	47	0.00	[0.00; 0.08]
#2091 Luo	8	127	0.06	[0.03; 0.12]
#2217 Wong	13	135	0.10	[0.05; 0.16]
Random effects model		309	0.06	[0.03; 0.14]
Prediction interval				[0.00; 0.99]
Heterogeneity: $I^2 = 0\%$, $\tau^2 = 0.1362$, $p = 0.62$				
setting = Contact investigation, aggregated				
#599 Hijnen, D	1	11	0.09	[0.00; 0.41]
#665 Brandstetter, S	2	36	0.06	[0.01; 0.19]
#821 Zhang, W2	4	12	0.33	[0.10; 0.65]
#477 Cheng, HY	4	22	0.18	[0.05; 0.40]
#249 Wang, Z	4	47	0.09	[0.02; 0.20]
#597 Wu, J	8	83	0.10	[0.04; 0.18]
#122 Luo, L	8	129	0.06	[0.03; 0.12]
#2263 Aherfi	9	63	0.14	[0.07; 0.25]
#443 Bi, Q	17	87	0.20	[0.12; 0.29]
#908 Yang, R	33	78	0.42	[0.31; 0.54]
Random effects model		568	0.14	[0.09; 0.22]
Prediction interval				[0.03; 0.49]
Heterogeneity: $I^2 = 82\%$, $\tau^2 = 0.5243$, $p < 0.01$				
setting = Outbreak investigation				
#1049 Romao	0	14	0.00	[0.00; 0.23]
#2218 Kittang	0	40	0.00	[0.00; 0.09]
#242 Danis, K	1	13	0.08	[0.00; 0.36]
#713 Böhmer, MM	1	16	0.06	[0.00; 0.30]
#3487 Pray	1	78	0.01	[0.00; 0.07]
#763 Roxby, AC	3	6	0.50	[0.12; 0.88]
#152 Yang, N	2	10	0.20	[0.03; 0.56]
#396 Schwierzeck, V	2	12	0.17	[0.02; 0.48]
#2470 Pirnay	4	9	0.44	[0.14; 0.79]
#2249 Corcorran	3	17	0.18	[0.04; 0.43]
#376 Arons, MM	3	47	0.06	[0.01; 0.18]
#354 Park, SY	4	97	0.04	[0.01; 0.10]
#849 Dora, AV	6	19	0.32	[0.13; 0.57]
#1654 Yau	7	22	0.32	[0.14; 0.55]
#265 Tian, S	7	24	0.29	[0.13; 0.51]
#1335 Pavli	7	48	0.15	[0.06; 0.28]
#2826 Taylor [cluster:2]	7	190	0.04	[0.01; 0.07]
#2751 van den Besselaar	8	167	0.05	[0.02; 0.09]
#2826 Taylor [cluster:1]	9	89	0.10	[0.05; 0.18]
#1232 Patel	13	35	0.37	[0.21; 0.55]
#899 Solbach, W	10	97	0.10	[0.05; 0.18]
#1440 NA	14	64	0.22	[0.13; 0.34]
#1377 Wong	13	135	0.10	[0.05; 0.16]
#2705 Ladhani	46	105	0.44	[0.34; 0.54]
#1003 Graham, N	46	126	0.37	[0.28; 0.46]
#2540 García-Sierra	33	323	0.10	[0.07; 0.14]
#696 Pham, TQ	89	208	0.43	[0.36; 0.50]
#1714 Lee	80	694	0.12	[0.09; 0.14]
#2892 Kennelly [cluster:2]	97	395	0.25	[0.20; 0.29]
#1293 Borras-Bermejo [cluster:2]	144	403	0.36	[0.31; 0.41]
#2892 Kennelly [cluster:1]	193	710	0.27	[0.24; 0.31]
#1103 Kennelly	239	869	0.28	[0.25; 0.31]
#1293 Borras-Bermejo [cluster:1]	486	768	0.63	[0.60; 0.67]
Random effects model		5850	0.16	[0.11; 0.23]
Prediction interval				[0.02; 0.65]
Heterogeneity: $I^2 = 96\%$, $\tau^2 = 1.1906$, $p < 0.01$				
setting = Screening				
#1225 Han	17	17	1.00	[0.80; 1.00]
#1960 Tanacan	0	3	0.00	[0.00; 0.71]
#317 Hoehl, S	1	2	0.50	[0.01; 0.99]
#170 Chang, L	2	4	0.50	[0.07; 0.93]
#1972 Rauch	2	6	0.33	[0.04; 0.78]
#2909 AbdulRahman	3	6	0.50	[0.12; 0.88]
#2051 Starling	29	31	0.94	[0.79; 0.99]
#1929 Kutsuna	3	11	0.27	[0.06; 0.61]
#2473 van Buul	3	15	0.20	[0.04; 0.48]
#224 Arima, Y	4	12	0.33	[0.10; 0.65]
#4154 Wadhwa	6	17	0.35	[0.14; 0.62]
#2650 Stock	6	19	0.32	[0.13; 0.57]
#598 Rivett, L	5	30	0.17	[0.06; 0.35]
#622 Treibel, TA	12	44	0.27	[0.15; 0.43]
#1837 Tsou	10	100	0.10	[0.05; 0.18]
#1207 Deng	38	61	0.62	[0.49; 0.74]
#1264 Lombardi	17	139	0.12	[0.07; 0.19]
#1164 Meyers	58	81	0.72	[0.60; 0.81]
#2231 Chamie	23	81	0.28	[0.19; 0.40]
#1196 Chamie	23	83	0.28	[0.18; 0.39]
#294 Lavezzo, E	29	73	0.40	[0.28; 0.52]
#1541 Daniells	19	279	0.07	[0.04; 0.10]
#1839 Cariani	32	182	0.18	[0.12; 0.24]
#593 Lombardi, A	41	138	0.30	[0.22; 0.38]
#3674 Al-Qahtani	116	188	0.62	[0.54; 0.69]
#2054 Eythorsson	49	1797	0.03	[0.02; 0.04]
#4140 Ghinai	293	406	0.72	[0.68; 0.76]
Random effects model		3825	0.34	[0.23; 0.48]
Prediction interval				[0.03; 0.91]
Heterogeneity: $I^2 = 97\%$, $\tau^2 = 1.9744$, $p < 0.01$				
setting = Hospitalised adults				
#2774 Viñuela	8	8	1.00	[0.63; 1.00]
#2802 Bender [cluster:1]	0	2	0.00	[0.00; 0.84]
#2802 Bender [cluster:2]	6	6	1.00	[0.54; 1.00]
#2932 Berghoff	2	4	0.50	[0.07; 0.93]
#1155 Bogani	10	19	0.53	[0.29; 0.76]
#1349 Pongpirul	10	193	0.05	[0.03; 0.09]
#506 Wong, J	16	138	0.12	[0.07; 0.18]
#729 London, V	22	68	0.32	[0.22; 0.45]
#832 Andrikopoulou, M	46	158	0.29	[0.22; 0.37]
Random effects model		596	0.41	[0.14; 0.74]
Prediction interval				[0.00; 0.99]
Heterogeneity: $I^2 = 85\%$, $\tau^2 = 3.9268$, $p < 0.01$				
setting = Hospitalised children				
#2246 Hurst	87	293	0.30	[0.25; 0.35]
Random effects model		293	0.30	[0.25; 0.35]
Prediction interval				
Heterogeneity: not applicable				
setting = Hospitalised adults & children				
#1532 Mei	31	494	0.06	[0.04; 0.09]
#1159 Alshukry	164	417	0.39	[0.35; 0.44]
#1556 Almazeedi	473	1096	0.43	[0.40; 0.46]
Random effects model		2007	0.24	[0.08; 0.53]
Prediction interval				[0.00; 1.00]
Heterogeneity: $I^2 = 99\%$, $\tau^2 = 1.2113$, $p < 0.01$				
Random effects model		13448	0.22	[0.17; 0.27]
Prediction interval				[0.02; 0.80]
Heterogeneity: $I^2 = 96\%$, $\tau^2 = 1.7998$, $p = 0$				

0   0.2   0.4   0.6   0.8   1

Figure 1: Figure 1. Forest plot of proportion of people with asymptomatic SARS-CoV-2 infection, stratified by setting
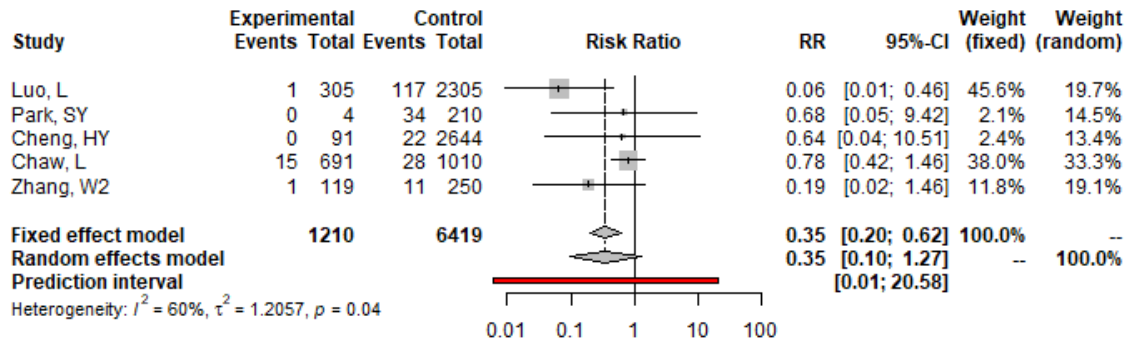
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Figure 2: Figure 2. Forest plot of secondary attack rate comparing infections in contacts of asymptomatic index cases with infections in contacts of symptomatic cases
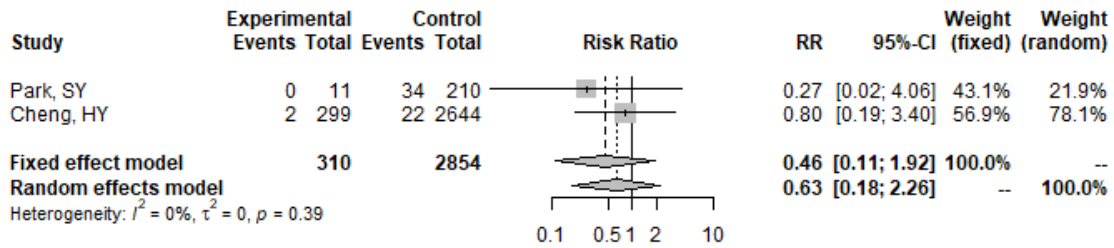

Figure 3: Figure 3. Forest plot of secondary attack rate comparing infections in contacts of presymptomatic index cases with infections in contacts of symptomatic cases
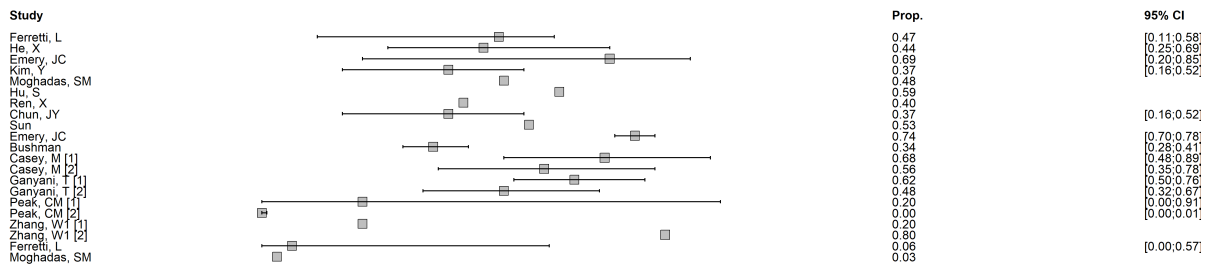

Figure 4: Figure 4. Forest plot of proportion of SARS-CoV-2 infection resulting from asymptomatic or presymptomatic transmission

record_id	label	setting
88	Ferretti, L	NA
88	Ferretti, L	NA
89	Ganyani, T [1]	Tianjin, China
89	Ganyani, T [2]	Singapore
183	Zhang, W1 [1]	Early Transmission in Wuhan
183	Zhang, W1 [2]	Imported Cases Outside Wuhan
279	He, X	NA
590	Emery, JC	Diamond Princess
591	Casey, M [1]	GI
591	Casey, M [2]	SI
728	Kim, Y	NA
798	Peak, CM [1]	Short SI
798	Peak, CM [2]	Long SI
1508	Moghadas, SM	New York City
1508	Moghadas, SM	New York City
1758	Hu, S	Households; workplace; healthcare facilities
2001	Ren, X	Throughout China outside Hubei
2034	Chun, JY	Government data, linked clusters such as religious groups, hospitals, or long-term healthcare
2084	Sun	NA
2325	Emery, JC	Diamond Princess Cruiseship
4517	Bushman	China, surveillance data