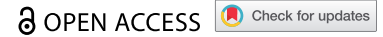


SHORT REPORT



Intention to vaccinate young children against COVID-19: A large-scale survey of Hong Kong parents

Eva Yi Hung Lau , Jian-Bin Li , and Derwin King Chung Chan 

Department of Early Childhood Education, The Education University of Hong Kong, Hong Kong, China

ABSTRACT

COVID-19 vaccines (Sinovac and Pfizer/BioNTech) have recently been approved for Hong Kong children. Understanding parental intentions to vaccinate children against COVID-19 is important to the development of an effective COVID-19 vaccine campaign. From a large-scale, geographically representative dataset in Hong Kong ($N = 11,141$), we examined parents' intentions to vaccinate their children against COVID-19 under three conditions: (1) no policy restrictions, (2) vaccination rate considered for school resumption, and (3) more choices of vaccine. Results showed that levels of vaccine hesitancy in Hong Kong parents are high. Hong Kong parents' intention to vaccinate their children was highest when there were more vaccines to choose from, followed by when vaccination rate was considered to resume school, and when there was no policy restrictions. Finally, Hong Kong parents with higher education backgrounds and family income were less willing to vaccinate their children. Together, these findings indicate that effective vaccines campaign should consider the characteristics and preferences of parents who have little intention to vaccinate within a specific social context.

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In Hong Kong, a city with a population of over 7 million people, the first case of Coronavirus (COVID-19) was detected on 21 January 2020. By the end of 2021, Hong Kong had experienced four waves of the pandemic, with a total of 12,630 cases and 213 related deaths. While Hong Kong has striven to pursue a zero-COVID policy, the city is currently experiencing its fifth and biggest wave of COVID-19. The wave resulted in over 1,123,561 cases, and 7,207 related deaths as of 28 March 2022. To contain the spread of the Omicron variant, strict restrictions have been implemented, such as social distancing policies and closure of schools, bars, and gyms.¹ The Hong Kong Government also implements a COVID-19 vaccination programme free of charge for all Hong Kong residents since March 2021. The vaccines were later approved for Hong Kong adolescents aged 12 to 17 in December 2021.

A "vaccine pass" is currently enforced in Hong Kong. Under the "vaccine pass", all individuals aged 12 or above must have received COVID-19 vaccination in order to enter a list of specified premises, including supermarkets, restaurants, and shopping centers. While all schools resumed half-day face-to-face teaching before the current wave of pandemic, full-day face-to-face teaching in secondary schools was allowed if all staff members and 70% of students have received two doses of a COVID-19 vaccine. Like many societies (e.g., mainland China and America), COVID-19 vaccines (Sinovac and Pfizer/BioNTech) have recently been approved for Hong Kong children as young as 5 years old and 3 years old in January 2022 and February 2022 respectively. Having children vaccinated is essential for inducing herd immunity to keep COVID-19 under control.² As such, promoting vaccination among young children is a public health priority.

Understanding parental intentions to vaccinate children against COVID-19 is important to the development of an effective COVID-19 vaccines campaign. Previous studies show that parental willingness to vaccinate children varied across countries.³⁻⁷ A small study ($N = 349$) was conducted before vaccines were approved for young children in Hong Kong in early 2021.⁸ It was found that only 21.2% of parents would have their school-age children vaccinated when the vaccines became available for children. This was the lowest rate compared to those from other countries.⁹ However, no large-scale research has examined Hong Kong parents' concurrent intentions to vaccinate their 5 to 11 year old children against COVID-19. From a large-scale geographically representative dataset in Hong Kong, we examined the intention of parents to vaccinate their children against COVID-19 under different conditions (i.e., (1) no policy restrictions, (2) vaccination rate considered for school resumption, and (3) more choices of vaccine).

Data was collected between 20 January 2022 to 27 January 2022 from 11,141 parents of 14,468 unvaccinated kindergarten and primary school aged children. A survey invitation was emailed to all Hong Kong kindergartens (>1000) and primary schools (>500) and posted on a University Facebook fan page managed by the unit the authors are affiliated with. Parents provided consent and completed a survey online via Qualtrics. Participating parents had an average of 1.30 children aged 5-12 years, and are considered to be a mostly middle-class sample.¹⁰ Among the participating parents, 71.2% of them have received at least one dose of vaccine. Detailed demographic information can be found in Table 1.

In this study, the three items for the outcome variables used were self-devised items developed by the authors. A total of 20 parents were invited to complete a pilot survey. Minor changes to the wording in Chinese were made to enhance the clarity of items. In the final survey, parents indicated whether they would vaccinate each of their children against COVID-19 under the three conditions on a five-point Likert scale (from “1 = *strongly disagree*” to “5 = *strongly agree*”). The responses were recorded as “yes” (strongly agree and agree), “neutral”, and “no” (strongly disagree and disagree). The three items were: 1) “Without any policy restrictions, I will arrange this child to take COVID-19 vaccines”, 2) “If the arrangement of school resumption considers child vaccination rate, I will arrange this child to take COVID-19 vaccines”, and 3) “If there are more vaccine choices, I will arrange this child to take COVID-19 vaccines”. First, as there are currently various restrictions implemented in Hong Kong (e.g., “vaccine pass”) that affect the vaccination intention among the general population, we developed the first condition to explore the parents’ intention to vaccinate their children when there were no policy restrictions. Second, before schools were closed in this current wave of pandemic, whether Hong Kong secondary schools can resume full-day face-to-face teaching depended on the vaccination rate among secondary school staff and students (aged 12 or above). As such, it was assumed that the same arrangement may be extended to primary school and kindergarten students and hence, the second condition related to the arrangement of school resumption was developed. Third, because of the general public concern about the safety and effectiveness of COVID-19 vaccines, the third condition related to vaccine choices were developed to explore parents’ intention to vaccinate their children when different vaccine options are available. For each item, parents were asked to report their intention toward each of their children aged 5–12 if they had more than one child within this age range. A higher score indicated a stronger intention (i.e., lower hesitancy). The study was approved by the Human Research Ethics Committee of the at the authors’ university.

We conducted descriptive statistics to calculate parental willingness to vaccinate their children against COVID-19. For the no policy restriction condition, 12,239 (84.6%) parents were unwilling to vaccinate their children, 829 (5.7%) parents were neutral about vaccination, and 1,400 (9.7%) parents were willing to vaccinate their children (Figure 1). For school resumption condition, 11,429 (79%) parents were unwilling to vaccinate their children, 1088 (7.5%) parents were neutral, and 1,951 (13.5%) parents were willing to vaccinate their children. For the more choices of vaccines condition, 10,229 (70.7%) parents were unwilling to vaccinate their children, 2,130 (14.7%) parents were neutral, and 2,109 (14.6%) parents were willing to vaccinate their children. These findings demonstrate that Hong Kong parents have a very low willingness to vaccinate their children at the time of survey.

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To compare whether parental willingness to vaccinate children against COVID-19 would differ among conditions, we carried out Friedman Test and Wilcoxon Test to compare the percentages across conditions. Results of Friedman Test showed that parents’ willingness differed significantly across the three conditions, $\chi^2(2) = 2,048.93$, $p < .001$. A follow-up Wilcoxon Test was carried out for pair-wise comparisons, with a Bonferroni correction of p value (i.e., $.05/3 = .0167$) as the significant level. Based on negative ranks, parental willingness to vaccinate children was lower under the condition of no restrictions than under school resumption ($z = > -23.64$, $p < .001$) and under more choices of vaccine ($z = > -37.49$, $p < .001$). Moreover, parental willingness under the condition of school resumption was lower than under the condition of more choices of vaccines ($z = > -20.84$, $p < .001$). These findings suggested that although parental willingness to vaccinate children was very low across the three conditions, there were significant nuanced differences. Parental hesitance was *lower* when more options were available and when the vaccination campaign was related to school resumption.

We conducted a multinomial logistic regression to investigate the associations between a range of demographic variables with parental willingness to vaccinate children, as compared to parental unwillingness, across conditions. The results are summarized in Table 1. The results show that compared to parents who were unwilling to vaccinate their children across conditions, parents who were willing to vaccinate their children were more likely to be male (except for under the school resumption condition), be older (especially older than 50), earn less, have lower levels of education, be vaccinated themselves, and have children in higher grades.

Expanding vaccination coverage to children is an important strategy in reducing the burden of the pandemic. However, prior studies have documented hesitancy among parents to vaccinate children. Understanding parental intentions to

Table 1. Summary of demographic variables and multinomial logistic regression for the associations between demographic variables and parents' willingness across conditions (parents not willing to vaccinate their children as reference group).

	N (%)	No policy restriction					School resumption					More choices of vaccines						
		B(SE)	p	OR	95% CI	B(SE)	p	OR	95% CI	B(SE)	p	OR	95% CI	B(SE)	p	OR	95% CI	
Informant																		
Father (ref)	1,565 (14%)																	
Mother	9,576 (86%)	−24 (.08)	.003	0.789	[.673, .924]	−.08 (.07)	.267	0.923	[.800, 1.064]	−.21 (.07)	.002	0.810	[.707, .928]					
Parent age																		
30 years or below (ref)	541 (4.8%)																	
31–40	6,763 (60.7%)	0.06 (.16)	.696	1.065	[.778, 1.457]	0.17 (.14)	.230	1.185	[.898, 1.565]	0.03 (.13)	.796	1.035	[.799, 1.340]					
41–50	3,707 (33.3%)	0.40 (.17)	.016	1.490	[1.079, 2.058]	0.51 (.15)	<.001	1.672	[1.256, 2.226]	0.37 (.14)	.006	1.452	[1.111, 1.897]					
>50	130 (1.2%)	1.872 (.25)	<.001	6.501	[3.953, 10.691]	1.87 (.24)	<.001	6.507	[4.075, 10.390]	1.34 (.24)	<.001	3.817	[2.408, 6.051]					
Family monthly income																		
HK\$20,000 or below (ref)	1,523 (13.7%)																	
HK\$20,001 – HK\$40,000	3,168 (28.4%)	−.78 (.09)	<.001	0.458	[.382, .551]	−.69 (.08)	<.001	0.502	[.427, .590]	−.62 (.08)	<.001	0.539	[.461, .632]					
HK\$40,001 – HK\$60,000	2,678 (24.0%)	−.84 (.10)	<.001	0.431	[.352, .528]	−.93 (.09)	<.001	0.395	[.330, .474]	−.83 (.09)	<.001	0.435	[.365, .518]					
HK\$60,001 – HK\$80,000	1,532 (13.8%)	−.71 (.12)	<.001	0.490	[.387, .622]	−.67 (.11)	<.001	0.511	[.416, .629]	−.60 (.10)	<.001	0.547	[.448, .668]					
HK\$80,001 – HK\$100,000	942 (8.5%)	−.64 (.14)	<.001	0.526	[.403, .688]	−.68 (.12)	<.001	0.507	[.400, .642]	−.77 (.12)	<.001	0.464	[.367, .586]					
> HK\$100,000	1,298 (11.7%)	−.25 (.12)	.039	0.780	[.615, .988]	−.36 (.11)	.001	0.696	[.563, .861]	−.44 (.11)	<.001	0.646	[.525, .796]					
Education																		
Primary school or below (ref)	3,363 (30.2%)																	
Secondary school to associate degree	2,305 (20.7%)	−.13 (.09)	.146	0.881	[.742, 1.045]	−.21 (.08)	.008	0.814	[.700, .947]	−.06 (.08)	.450	0.945	[.816, 1.094]					
Bachelor's degree or above	5,473 (49.1%)	−.43 (.09)	<.001	0.652	[.552, .770]	−.37 (.07)	<.001	0.694	[.600, .802]	−.18 (.07)	.013	0.838	[.729, .964]					
Parent's history of COVID-19 vaccination																		
No (ref)	3,206 (28.8%)																	
Yes (at least one dose)	7,935 (71.2%)	3.16 (.18)	<.001	23.638	[16.560, 33.740]	2.94 (.13)	<.001	18.987	[14.59, 24.70]	2.26 (.10)	<.001	9.550	[7.919, 11.518]					
Child sex																		
Girl (ref)	7,311 (50.5%)																	
Boy	7,157 (49.5%)	0.10 (.06)	.101	1.102	[.981, 1.237]	0.07 (.05)	.190	1.070	[.967, 1.184]	0.10 (.05)	.053	1.102	[.999, 1.216]					
Child school grade																		
Kindergarten (ref)	4,832 (33.4%)																	
P1 – P3	6,771 (46.8%)	0.29 (.07)	<.001	1.337	[1.157, 1.545]	0.33 (.06)	<.001	1.387	[1.226, 1.570]	0.24 (.06)	<.001	1.276	[1.133, 1.436]					
P4 – P6	2,865 (19.8%)	0.86 (.08)	<.001	2.373	[2.015, 2.795]	0.76 (.07)	<.001	2.143	[1.853, 2.477]	0.78 (.07)	<.001	2.153	[1.872, 2.476]					

ref: reference group.

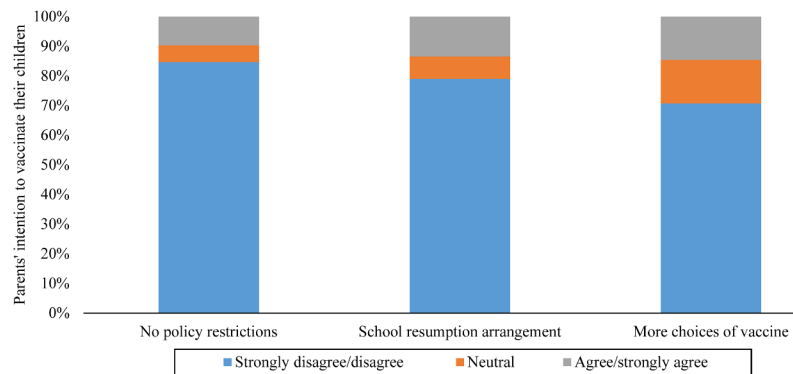


Figure 1. Parents' Intention to Vaccinate their Children across Conditions

Figure 1. Parents' intention to vaccinate their children across conditions.

vaccinate children against COVID-19 is vital to the development of public health strategies to increase the vaccination rate. Findings of the current survey suggest that although recent severe cases of infections involving young children in Hong Kong have sparked concern among parents, Hong Kong parents' hesitancy to vaccinate children against COVID-19 is high in all three conditions and compared to other countries worldwide.^{4,5,7,11}

This study offers the unique information that Hong Kong parental intentions to vaccinate children is higher when there are more choices of vaccine, followed by school resumption and no policy restriction. As Hong Kong parents are concerned about the safety of the vaccine for children,⁶ their intention to vaccinate their children may be higher when they are able to choose among vaccines that are considered safe and effective for their children. However, Hong Kong children have experienced a prolonged period of school suspension. It is also likely that parental intentions to vaccinate their children would increase when vaccination of children promotes a return to school.

Finally, contrary to most existing findings,^{12–16} but consistent with a prior study in the local context,⁸ Hong Kong parents with higher education backgrounds and family income were less willing to vaccinate children. Hong Kong parents, particularly those with higher SES backgrounds, may have lower rates of intention to vaccinate their children. This is perhaps because COVID-19 cases among children have been rare in Hong Kong until the 5th wave of pandemic, and because the COVID-19 vaccination has only recently been approved for children. While we did not have any direct information about parents' knowledge and perception about the safety and effectiveness of the COVID-19 vaccines, it is speculated that parents with higher SES backgrounds may expect more information about the vaccines before they decide to let their children take the vaccines.

Several limitations of this study should be noted. First, the use of an online survey may prohibit the participation for parents who have no access to online surveys. Second, the voluntary basis of our online survey may have resulted in recruiting parents with stronger attitudes toward COVID-19 vaccines for children. Third, data was collected during a resurgence of the pandemic in Hong Kong and soon after the COVID-19 vaccination is approved for

children. As the current wave of outbreak continues and parents learn new information, their intentions may change. Finally, our analyses did not take into account the level of information parents have and the degree of confidence they feel about the vaccines.

Nevertheless, our findings indicate that parents needed to obtain more information about COVID-19 vaccines for children. Our findings also suggested that effective vaccines campaign should consider the characteristics of parents who have low intention to vaccinate their children within a specific social context. As such, efforts are needed to strengthen the provision of information to parents about the efficacy and safety, as well as risks and consequences of infection for children, especially among better educated and higher income parents, to help parents make the decision timely. In particular, the government could collaborate with organizations (e.g., schools and community family service centers) that are considered reliable and trustworthy by parents in disseminating vaccines information. Last but not least, the government should ensure vaccine choices are available for parents and consider providing educational incentives, such as allowing full-day schooling and after-school activities, to children who are vaccinated to promote vaccination among young children.

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ORCID

Eva Yi Hung Lau  <http://orcid.org/0000-0002-1176-0457>

Jian-Bin Li  <http://orcid.org/0000-0002-8995-3304>

Derwin King Chung Chan  <http://orcid.org/0000-0001-8200-0263>

References

1. The Government of the Hong Kong Special Administrative Region. Frequently asked questions on new requirements to reduce gatherings, https://www.coronavirus.gov.hk/eng/social_distancing-faq.html
2. Zou X, Cao B. COVID-19 vaccines for children younger than 12 years: are we ready? *Lancet Infect Dis.* 2021;21(12):1614–15. doi:10.1016/S1473-3099(21)00384-4.
3. Szilagyí PG, Shah MD, Delgado JR, Thomas K, Vizueta N, Cui Y, Vangala S, Shetgiri R, Kapteyn A. Parents' intentions and perceptions about COVID-19 vaccination for their Children: results from a national survey. *Pediatrics.* 2021;148(4):e2021052335. doi:10.1542/peds.2021-052335.
4. Evans S, Klas A, Mikocka-Walus A, German B, Rogers GD, Ling M, Fernando JW, Kothe E, Westrupp EM. "Poison" or "protection"? a mixed methods exploration of Australian parents' COVID-19 vaccination intentions. *J Psychosom Res.* 2021;150:110626. doi:10.1016/j.jpsychores.2021.110626.
5. Goldman RD, Yan TD, Seiler M, Cotanda CP, Brown JC, Klein EJ, Hoeffe J, Gelernter R, Hall JE, Davis AL, et al. Caregiver willingness to vaccinate their children against COVID-19: cross sectional survey. *Vaccine.* 2020;38(48):7668–73. doi:10.1016/j.vaccine.2020.09.084.
6. Humble RM, Sell H, Dube E, MacDonald NE, Bobinson J, Driedger SM, Sadarangani M, Meyer SB, Wilson S, Benzie KM, et al. Canadian parents' perceptions of COVID-19 vaccination and intention to vaccinate their children: results from a cross-sectional national survey. *Vaccine.* 2021;39(52):7669–76. doi:10.1016/j.vaccine.2021.10.002.
7. Zhang KC, Fang Y, Cao H, Chen H, Hu T, Chen YQ, Zhou X, Wang Z. Parental acceptability of COVID-19 vaccination for children under the age of 18 years: cross-sectional online survey. *JMIR Pediatr Parent.* 2020;3(2):e24827. doi:10.2196/24827.
8. Kwok KO, Li KK, Wei WI, Tsoi MTF, Tang A, Lam HS, McNeil EB, Wong SYS. Likelihood of COVID-19 vaccination among primary school students in Hong Kong. *Clin Microbiol Infect.* 2022;28(1):142–44. doi:10.1016/j.cmi.2021.09.029.
9. Galanis P, Vraka I, Siskou O, Konstantakopoulou O, Katsirompa A, Kaitelidou D. Willingness and influential factors of parents to vaccinate their children against the COVID-19: a systematic review and meta-analysis. medRxiv. 2021.
10. Census and Statistics Department. Households. 2022 [accessed 2022 Feb 1]. <https://www.censtatd.gov.hk/en/scode500.html>.
11. Wan X, Huang H, Shang J, Xie Z, Jia R, Lu G, Chen C. Willingness and influential factors of parents of 3–6-year-old children to vaccinate their children with the COVID-19 vaccine in China. *Hum Vaccin Immunother.* 2021;17(11):3969–74. doi:10.1080/21645515.2021.1955606.
12. Urrunaga-Pastor D, Herrera-Añazco P, Uyen-Cateriano A, Toro-Huamanchumo CJ, Rodríguez-Morales AJ, Hernández AV, Benites-Zapata VA, Bendezu-Quispe G. Prevalence and factors associated with parents' non-intention to vaccinate their children and adolescents against COVID-19 in Latin America and the Caribbean. *Vaccines.* 2021;9(11):1303. doi:10.3390/vaccines9111303.
13. Babicki M, Pokorna-Kałwak D, Doniec Z, Mastalerz-Migas A. Attitudes of parents with regard to vaccination of children against COVID-19 in Poland. a nationwide online survey. *Vaccines.* 2021;9(10):1192. doi:10.3390/vaccines9101192.
14. Humble RM, Sell H, Dubé E, MacDonald NE, Robinson J, Driedger SM, Sadarangani M, Meyer SB, Wilson S, Benzie KM, et al. Canadian parents' perceptions of COVID-19 vaccination and intention to vaccinate their children: results from a cross-sectional national survey. *Vaccine.* 2021;39(52):7669–76. doi:10.1016/j.vaccine.2021.10.002.
15. Yoda T, Katsuyama H. Parents' hesitation about getting their children vaccinated against COVID-19 in Japan. *Hum Vaccines Immunother.* 2021;1–6. doi:10.1080/21645515.2021.1981087.
16. Bagateli LE, Saeki EY, Fadda M, Agostoni C, Marchisio P, Milani GP. COVID-19 vaccine hesitancy among parents of children and adolescents living in Brazil. *Vaccines.* 2021;9(10):1115. doi:10.3390/vaccines9101115.