

ORIGINAL RESEARCH

Exacerbation of household food insecurity among low-income families in Hong Kong during the COVID-19 pandemic

Tony K. C. Yung PhD, APD¹  | Sabina Y. T. Tsang MPH¹ | Daisy D. S. Tam PhD²

¹Jockey Club School of Public Health and Primary Care, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong

²Department of Humanities and Creative Writing, Hong Kong Baptist University, Kowloon Tong, Hong Kong

Correspondence

Tony K. C. Yung, Jockey Club School of Public Health and Primary Care, Prince of Wales Hospital, Chinese University of Hong Kong, Room 308, 3/F, Shatin, NT, Hong Kong.

Email: yungtony@cuhk.edu.hk

Abstract

Aim: The economic depression and reduced physical mobility associated with COVID-19 potentially affected the food security status of the poor. This study aimed to assess the possible worsening of perceived food insecurity among low-income families in Hong Kong.

Methods: Families either receiving government subsidies or living in a subdivided flat referred by local non-governmental organisations were invited to participate in a telephone survey. Food security status before (by recalling) and during the pandemic were assessed using Household Food Insecurity Access Scale. Chi-square analysis and ANOVA were used to test the difference between the percentage of participants who responded affirmatively to survey questions and various categories of food insecurity. Paired t-test was used to examine the reported change in food insecurity score before and during the COVID-19 pandemic. Association between socio-demographic factors and change in food insecurity score was then assessed by multiple linear regression using backward stepwise elimination.

Results: Findings from the 212 households revealed that, for all nine questions concerning food insecurity, there was a significantly higher percentage of affirmative responses during versus before the pandemic. The proportion of food-secure households dropped from 16.5% to 7.1% amidst the pandemic. By contrast, households with severe food insecurity increased from 19.3% to 33.5%. Regression analysis showed that those households who were living in subdivided flats and with high monthly housing expenses, were likely to experience an exacerbation of food insecurity. Meanwhile, households with divorced parents (probably due to consistent social subsidy) and high household incomes, showed resilience toward food insecurity. Concurrently, about one fifth of children in these households had an experience of starvation for a whole day due to financial constraints.

Conclusion: The exacerbation of food insecurity among low-income families during the COVID-19 pandemic necessitates timely assessments and the implementation of appropriate measures to prevent them from experiencing physiological harm. These initiatives can be guided by the identified at-risk socio-economic characteristics in the present study.

KEYWORDS

COVID-19, food security, low-income families, undernutrition

1 | INTRODUCTION

Household food insecurity is a growing public health concern. It can refer to the inadequate access to a sufficient quantity and quality of food, due to physical and financial constraints. It also covers peoples' perception of whether or not their household can obtain sufficient food to meet their future needs. Numerous studies have shown that food insecurity could result in nutrient inadequacies, as well as negative physical and mental effects.^{1–5} These effects on vulnerable populations, including children under five years, are usually serious because of their accelerated growth.^{6,7} Indeed, even temporary food insecurity has been associated with long-term developmental, psychosocial, and emotional harm.⁸ Similarly, household food insecurity is a strong predictor of childhood malnutrition because of its direct association with the availability and quality of food within a household.⁹ Children who have grown up in a household with food insecurity are more likely to be stunted.¹⁰

Undoubtedly, a lack of resources is a primary cause of household food insecurity. In rural settings, however, limited availability of food due to high transportation costs also remains a significant barrier for households' ability to obtain sufficient safe and nutritious food.¹¹ In spatially small and dense metropolitan cities covered by a well-integrated transportation network such as Hong Kong, the factors associated with household food insecurity are not fully disclosed, although preliminary results revealed that it exists among low-income families.¹²

Low-income families in developing countries are more likely to suffer from food insecurity compared with their high-income counterparts. Both macro- and micro-nutrient deficiencies are extremely common among this population and are found to be highly dependent on varying food prices.^{13–15} In developed regions, food insecurity constitutes an emerging challenge found to be associated with factors like climate change, household income, access to markets, and local environmental risks.¹⁶ Nonetheless, given the availability of social subsidies in some developed regions and the fact that wealth inequality varies largely across different localities, the nature and associated factors of food insecurity may not be the same across these countries. Furthermore, the extent to which low-income families suffer from food insecurity in such regions is largely unknown, despite its prominence in governments that are formulating relevant policies to help this population.

On March 11, 2020, the coronavirus disease (COVID-19) was declared as a pandemic by the World Health Organization. According to the World Food Program and Food Security Information Network, the number of individuals affected by acute food insecurity globally, was expected to reach 135 million by the end of 2020 compared with before the pandemic.¹⁷ As the pandemic continues to run rampant and control measures are imposed worldwide, the virus could no doubt expose more people to food insecurity in the future.¹⁸ For example, disruptions of food supply chains could result from containment strategies that limit labor mobility and restrict the transportation of food products within and across countries during the pandemic. In addition, the availability of affordable food could be threatened when food prices are driven up by panic buying and decline in agricultural production. Meanwhile, food affordability could further be reduced because of unemployment, reduction in income, and decline in purchasing power, which are linked to economic recession amid the pandemic.

In Hong Kong, the first two COVID-19 cases were confirmed and reported on January 23, 2020. As of June 2nd, 2021, 11 849 confirmed cases and 210 deaths had been reported.¹⁹ The pandemic has created grave challenges for Hong Kong's economy. According to the Census and Statistics Department of Hong Kong, the seasonally adjusted unemployment rate increased to 6.6% in the fourth quarter of 2020 from 3.3% in the same period of 2019,²⁰ reaching its highest level in 16 years. Meanwhile, food security could be severely threatened by the 2.2% increase in the year-on-year Composite Consumer Price Index for food,²¹ and the drop in the median monthly household income from HK\$28800 in the third quarter of 2019 to HK\$26500 in the same quarter of 2020.²² These effects of the COVID-19 pandemic on food security, could be further magnified among poor households already vulnerable to limited financial capacity to purchase food before the pandemic—considering that household income is always the strongest determinant of food security across countries and cultures.²³

Given its high-income disparity with a GINI index of 0.533, about 20% of Hong Kong's population actually lives in poverty.²⁴ Low-income households spend almost double their expenditure (39.9%) on food compared with their highest-income counterparts (21%).¹² Moreover, people from low-income households have accounted for nearly half (45.5%) of the unemployed population during the COVID-19 pandemic.²⁵ Thus, the authors

hypothesised that COVID-19 reduced food acquisition and security among low-income households during the pandemic. This study therefore aimed to document the reported change in household food security level and its associated household factors before and during the COVID-19 pandemic among low-income families in Hong Kong. It also describes the various dietary and behavioural adaptations adopted by these families in facing food insecurity during the pandemic. Since children are more vulnerable to food insecurity, the present study focused on those adaptations that affected their personal food security across this long-lasting pandemic.

2 | METHODS

The subjects for study were low-income families in Hong Kong, who were either receiving Comprehensive Social Security Assistance (CSSA) Scheme²⁶ or were living in subdivided flats in Hong Kong. A subdivided flat is a privately owned flat subdivided into two or more individual rooms, sometimes self-contained. Subdivided flats are cheap and are usually tenanted to people who cannot afford the market rental of ordinary apartments. Inclusion criteria for this study included having a survey respondent (1) of age 18 years or above, (2) able to communicate through Chinese, and (3) is usually responsible for handling meals in the household.

An anonymous telephone survey was conducted from February to March 2021, drawing on a phone list of 385 households provided by Oxfam Hong Kong and its collaborating local NGOs that serve low-income populations. The list contains all the reachable low-income families that they were serving in one of the districts in Hong Kong, which represents the lowest socio-economic status in the territory. Due to the very high income disparity, and the fact that expenditure in housing constitutes the main part of the expense of low-income families, the vast majority of poor people in Hong Kong live in a few particular districts including the one that was surveyed in the present study. Informed consent was collected by three trained interviewers before the actual survey, and a total of 212 eligible families were successfully interviewed out of the provided 385 households. The main reasons for declining survey invitation were unavailability due to other engagement, as well as “not interested.”

Household food security was assessed using the Household Food Insecurity Access Scale (HFIAS) developed by the United States Agency for International Development.²⁷ The HFIAS is a nine-item scale that uniquely gauges perceptions, reactions, and behaviour responses due to limited resources to food access among households, reflecting three aspects (domains) of food

insecurity (i.e., anxiety about the household food supply, inadequate food quality, and insufficient food intake) that follow a progression. The HFIAS has been used and validated across developed and developing regions,^{28–30} showing good internal consistency (Cronbach's α 0.73–0.95), acceptable validity, and reliability in assessing the food security status of households.³¹ To adapt it to the local context, the tailored Chinese version of the HFIAS was used after being reviewed by a group of local key informants and refined accordingly.²⁷ One major adaptation was the use of wording. Since a lack of food in one's household may lead to feelings of shame in Chinese culture, the phrase “a lack of resources” replaced the corresponding wording in the questions wherever necessary. Also, in Chinese culture, it is a virtue to finish all of one's food at a meal, even when you dislike it. Thus, when asked about the relevant questions of HFIAS, the interviewer had to emphasise and differentiate whether it was due to a lack of resources.

In analysing the HFIAS, a 4-point Likert scale was used to indicate the frequency of occurrence for the nine items in the past 30 days (“Never” 0 score; “rarely” 1 score; “sometimes” 2 score; and “often” 3 score). Thus, the total HFIAS score would range from 0 to 27. The higher the score, the greater the food insecurity experienced by the household.

The HFIAS also categorises households into four levels of household food insecurity, namely, food secure and mild, moderately, and severely food insecure. Households are categorised as increasing food insecure as they respond affirmatively to more severe conditions (from questions 1 to 9)—as stated in HFIAS. This categorisation is independent of the total HFIAS score abovementioned. For instance, if a household often cut back on size (question 5) or frequency (question 6) of meals, and/or experienced any of the three extreme conditions (question 7 about running out of food; question 8 about going to bed hungry; question 9 about going a whole day and night without eating), it was classified as severely food insecure.

The household food security level was captured before and during the COVID-19 pandemic, and respondents were first asked about their current household food security level. Following this, they were asked to answer the same set of questions under the HFIAS by recalling their food storage and meal situation right before the pandemic (i.e., November 2019).

Participating households were asked about their coping strategies in facing food insecurity during the COVID-19 pandemic. A list of 10 questions in relation to household adaptations was posed. The frequency of adopting these coping strategies was marked as either “never,” “rarely,” “sometimes,” and “often.” In addition, a total of four adaptations involving potential childhood food

TABLE 1 Characteristics of participating households (N = 212)

	n (%)
Family size	
2	19 (9.0)
3	56 (26.4)
4	97 (45.8)
5	31 (14.6)
6 or above	9 (4.2)
Number of children	
1	67 (31.6)
2	115 (54.2)
3 or above	30 (14.2)
Marital status	
Married	163 (76.9)
Cohabitation	5 (2.4)
Separation	11 (5.2)
Divorced	31 (14.6)
Widowed	1 (0.5)
Declined to answer	1 (0.5)
Recipient of Comprehensive Social Security Assistance	
Yes	44 (20.8)
No	167 (78.8)
Decline to answer	1 (0.5)
Housing type	
Public housing estate	63 (29.7)
Home ownership scheme (government supported)	22 (10.4)
Private housing (rent)	5 (2.4)
Private housing (own)	3 (1.4)
Subdivided flat	102 (48.1)
Rooftop housing	4 (1.9)
Others	13 (6.1)
Monthly household income (HKD)	
<5000	5 (2.4)
5000–7499	6 (2.8)
7500–9999	17 (8.0)
10 000–12 499	38 (17.9)
12 500–14 999	31 (14.6)
15 000–17 499	40 (18.9)
17 500–19 999	23 (10.8)
20 000–22 499	22 (10.4)
22 500–24 999	5 (2.4)
25 000 or above	3 (1.4)
Declined to answer	22 (10.4)

TABLE 1 (Continued)

	n (%)
Economically active member	
0	41 (19.3)
1	137 (64.6)
2	33 (15.6)
3 or above	1 (0.5)
Monthly expense on housing (HKD)	
<2000	3 (1.4)
2000–3999	51 (24.1)
4000–5999	83 (39.2)
6000–7999	51 (24.1)
8000–9999	10 (4.7)
10 000–11 999	1 (0.5)
Declined to answer	13 (6.1)

insecurity were recorded using the same Likert scale. Since food-related behavioural adaptations are largely culture-specific, the development of these questions made reference to a previous local survey with consent.³² They were then reviewed by the same group of local key informants during the validation of HFIAS.

Apart from the COVID-19 pandemic, which is the main predictor of food insecurity, the study also included another eight relevant socio-demographic factors that were later analysed as covariants in the final regression model. The selection of which are either locally specific (CSSA reception status, housing type, and monthly housing expenditure) or have been found to be widely supported by previous studies (family size, number of children, marital status, monthly household income, and number of economically active members).^{23,33,34}

Chi-square analysis and ANOVA were used to test the difference between the percentage of participants responded affirmatively to HFIAS questions and various categories of food insecurity. Paired *t*-test was used to examine the reported change in HFIAS score before and during the COVID-19 pandemic. Association between socio-demographic factors and change in HFIAS score was then assessed by multiple linear regression using backward stepwise elimination. Initially, all eight of the abovementioned socio-demographic variables were entered as predictors and the change in HFIAS score was entered as the outcome variable in bivariate regression—while only variables with a *p*-value <0.25 were entered in the subsequent multivariate linear regression. The final prediction model was then obtained after backward stepwise elimination with a cutoff value of *p*-value ≤ 0.05. SPSS software (version 25) for Windows was used to

TABLE 2 Food security status of participants according to Household Food Insecurity Access Scale ($N = 212$)

	Before COVID-19 pandemic		During COVID-19 pandemic		<i>p</i> for χ^2 or ANOVA
	Never (%)	Affirmative (%)	Never (%)	Affirmative (%)	
HFIAS domains					
Domain 1 (Anxiety and uncertainty)					
Worry about enough food at home	55 (25.9)	157 (74.1)	34 (16.0)	178 (84.0)	<0.001
Domain 2 (Insufficient quality)					
Unable to eat preferred foods	58 (27.4)	154 (72.6)	35 (16.5)	177 (83.5)	<0.001
Eat a limited variety of foods	63 (29.7)	149 (70.3)	34 (16.0)	178 (84.0)	<0.001
Eat foods that do not want to eat	70 (33.0)	142 (67.0)	43 (20.3)	169 (79.7)	<0.001
Domain 3 (Insufficient food intake)					
Eat a smaller meal	119 (56.1)	93 (43.6)	82 (38.7)	130 (61.3)	<0.001
Eat fewer meals in a day	139 (65.6)	73 (34.4)	114 (53.8)	98 (46.2)	<0.001
No food to eat of any kind in the household	154 (72.6)	58 (27.4)	146 (68.9)	66 (31.1)	<0.001
Go to sleep at night hungry	170 (80.2)	42 (19.8)	151 (71.2)	61 (28.8)	<0.001
Go a whole day and night without eating	179 (84.4)	33 (15.6)	171 (80.7)	41 (19.3)	<0.001
HFIAS categories					
		<i>n</i> (%)		<i>n</i> (%)	
Food secure		35 (16.5)		15 (7.1)	
Mildly insecure		93 (43.9)		69 (32.5)	
Moderately insecure		50 (23.6)		57 (26.9)	
Severely food insecure		34 (16.0)		71 (33.5)	<0.001

Abbreviation: HFIAS, Household Food Insecurity Access Scale.

TABLE 3 Comparison of Household Food Insecurity Access Scale score before and during COVID-19 pandemic^a

	Full score	Before pandemic (mean \pm SD)	During pandemic (mean \pm SD)	Difference (95% CI)	<i>p</i> Value
Domain 1 (Anxiety and uncertainty)	3	1.18 \pm 0.06	1.50 \pm 0.06	0.32 (0.19–0.45)	<0.001
Domain 2 (Insufficient quality)	9	3.49 \pm 0.18	4.92 \pm 0.18	1.43 (1.18–1.69)	<0.001
Domain 3 (Insufficient food intake)	15	1.96 \pm 0.19	2.90 \pm 0.22	0.94 (0.67–1.20)	<0.001
HFIAS total	27	6.63 \pm 0.38	9.32 \pm 0.39	2.68 (2.17–3.20)	<0.001

Abbreviation: HFIAS, Household Food Insecurity Access Scale.

^aData was collected in February–March 2021.

perform data analysis (SPSS Inc.), and statistical significance for all statistical tests was considered at $p < 0.05$.

2.1 | Ethical approval

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Survey and Behavioural Research Ethics Committee of the Chinese University of Hong Kong (Reference no. SBRE-20-039). Written informed consent was obtained from all subjects/patients.

3 | RESULTS

The 212 households surveyed had a median family size of four people, with about half of them having two children. The majority (79.3%) of them were attended by both parents in either married or cohabitated status, and they were mostly living in either subdivided flats or public housing estates. The median household salary range was HK\$15 000–17 499, with HK\$4000–\$5999 spent on housing each month. Other household characteristics are given in Table 1.

By comparing the existing and pre-pandemic (perceived) answers of HFIAS, an exacerbation of food

TABLE 4 Regression analysis between change in Household Food Insecurity Access Scale score and household characteristics

Characteristics	Regression coefficient (95% CI)	p Value
Marital status		
Married	Ref	Ref
Cohabitation	-0.05	0.47
Separation	0.13	0.07
Divorced	-2.23 (-3.74 to -0.72)	0.004**
Widowed	0.06	0.40
Housing type		
Public housing estate	Ref	Ref
Home ownership scheme (government supported)	0.02	0.82
Private housing (rent)	0.09	0.22
Subdivided flat	1.17 (0.12-2.22)	0.03*
Rooftop housing	0.04	0.59
Monthly household income (HKD)		
<5000	Ref	Ref
5000-7499	0.08	0.27
7500-9999	-0.13	0.06
10 000-12 499	0.07	0.34
12 500-14 999	-0.01	0.89
15 000-17 499	-0.04	0.62
17 500-19 999	-2.21 (-3.83 to -0.59)	0.008**
20 000-22 499	-3.21 (-4.98 to -1.43)	<0.001***
22 500-24 999	0.03	0.68
25 000 or above	0.08	0.28
Monthly expense on housing (HKD)		
<2000	Ref	Ref
2000-3999	-0.04	0.61
4000-5999	-0.07	0.35
6000-7999	0.11	0.11
8000-9999	2.54 (0.21-4.87)	0.03*
10 000-11 999	0.00	0.98

Note: Only significant variables in the final model are shown; eliminated variables are family size, number of children, CSSA reception status, and number of economically active members. Bold values highlights the factors that are found significant in the regression analysis.

Abbreviations: CSSA, Comprehensive Social Security Assistance; HFIAS, Household Food Insecurity Access Scale.

*<0.05.

**<0.01.

***<0.001.

insecurity was observed among the participating households. Responses from the three domains of HFIAS showed that a significantly increased percentage of households experienced all the listed nine forms of food insecurity during the pandemic (all *p* values < 0.001)

(Table 2). For instance, the percentage of households that experienced (affirmative response) going to bed at night hungry increased from 19.8% before the pandemic to 28.8% during the pandemic. Meanwhile, the prevalence of going a whole day and night without eating increased from 15.6% to 19.3%. Before the pandemic, 16.5% of the participants were food secure, and this figure dropped to 7.1% amid the pandemic. By contrast, the number of participating households classified as severely food insecure increased from 19.3% to 33.5%. Referring to the HFIAS score, the mean total score (6.63 ± 0.3 vs. 9.32 ± 0.39 , $p < 0.001$) during the pandemic significantly increased (Table 3). The same finding applied to all three domain scores of HFIAS, with statistical significance, that is, domain 1 (anxiety and uncertainty, 1.18 ± 0.06 vs. 1.50 ± 0.06 , $p < 0.001$), domain 2 (insufficient quality, 3.49 ± 0.18 vs. 4.92 ± 0.18 , $p < 0.001$) and domain 3 (insufficient food intake, 1.96 ± 0.19 vs. 2.90 ± 0.22 , $p < 0.001$).

Table 4 shows regression analysis of change in HFIAS score. Factors associated with an increased HFIAS score (exacerbated food insecure) included those living in subdivided flats ($B = 1.17$, $p = 0.03$) and with high monthly expenses (HK\$8000-9999) on housing ($B = 2.54$, $p = 0.03$). Meanwhile, divorced parents ($B = -2.23$, $p = 0.004$) and high (HK\$17500-22 499) monthly household income ($B = -2.21$ to -3.21 , $p = 0.008$ to <0.001) were associated with a decreased HFIAS score.

Among the household coping strategies listed in Table 5, all of them had been adopted (shown by affirmative response) by over half of the participants at some point during the pandemic. The five most frequently practised ones included cutting down expensive meat (e.g., beef) (92.9%), reducing frequency of dining out (92.0%), reducing adults' food consumption for children's expenses (91.5%), eating the same kind of fruit and vegetable to save money (91.0%), and dividing soup and dishes for several consumptions (85.4%). As with coping strategies associated with children, the order of prevalence was "Child to reduce meal's portion size because of not enough money" (49.1%), "Child to skip meal because of not enough money" (43%), "Child is hungry because of not enough money to buy food" (30.2%), and "Child does not eat for a whole day because of not enough money to buy food" (20.3%).

4 | DISCUSSION

The COVID-19 pandemic has caused numerous directly induced deaths since its emergence. Although it is still ongoing, many studies are on their way to determine its indirect or long-term effect on human health. The current study aimed to reveal the food security status among low-income populations and results supported the

TABLE 5 Dietary adaptations and consequences in facing food insecurity during COVID-19 pandemic (*N* = 212)

	<i>n</i> (%)			
	Never	Rarely	Sometimes	Often
Household coping strategies				
Cutting down expensive meat, for example, beef	15 (7.1)	35 (16.5)	66 (31.1)	96 (45.3)
Reducing frequency of dining out	17 (8.0)	34 (16.0)	46 (21.7)	115 (54.2)
Reducing adults' food consumption for children's expenses	18 (8.5)	26 (12.3)	84 (39.6)	84 (39.6)
Eating the same kind of fruit and vegetable to save money	19 (9.0)	46 (21.7)	72 (34.0)	75 (35.4)
Dividing soup and dishes for several consumptions	31 (14.6)	30 (14.2)	82 (38.7)	69 (32.5)
Switching to eating porridge or rice noodle of cheaper price	28 (13.2)	49 (23.1)	90 (42.5)	45 (21.2)
Reducing frequency of consuming fresh fruit and vegetable	27 (12.7)	45 (21.2)	97 (45.8)	43 (20.3)
Replacing fresh food with packaged ready-to-eat food	27 (12.7)	48 (22.6)	97 (45.8)	40 (18.9)
Eating vegetable instead of meat	44 (21.8)	50 (23.6)	92 (43.4)	26 (12.3)
Reducing daily meals from three times to two times	73 (34.4)	68 (32.1)	53 (25.0)	18 (8.5)
Consequences related to child's food security				
Child to reduce meal's portion size because of not enough money	108 (50.9)	59 (27.8)	40 (18.9)	5 (2.4)
Child to skip meal because of not enough money	121 (57.1)	47 (22.2)	37 (17.5)	7 (3.3)
Child is hungry because of not enough money to buy food	148 (69.8)	51 (24.1)	11 (5.2)	2 (0.9)
Child does not eat for a whole day because of not enough money to buy food	169 (79.7)	36 (17.0)	5 (2.4)	2 (0.9)

hypothesis that the pandemic exacerbated household food insecurity in this vulnerable population, despite living in a high-income metropolitan city. These results are consistent with the report of Niles et al.,³⁵ that prevalence of household food insecurity increased by one-third since the pandemic outbreak. The findings from Wolfson et al.³⁶ was also coherent with the current study's result that highlighted the disadvantage that low-income populations suffer with regard to food security during the COVID-19 pandemic. The finding can be explained by a several factors. The implementation of lockdown and social distancing, as well as COVID-19 *per se*, massively disrupted local economies and food accessibility. In addition, the unemployment rate in Hong Kong reached its highest amid the pandemic. Additionally, low-income families usually have less savings, and are therefore less resilient to financial instability. All these factors contributed to inconsistent physical and economic access to sufficient nutritious food, thus causing food insecurity.

Compared with participants who were living in public housing estates, those who were living in subdivided flats were more likely to have a greater increment in HFIAS score, namely, more being food insecure. In Hong Kong, the government provides rental housing (public housing estates) to those who cannot afford to rent or own private housing, at a relatively low price. However, numerous low-income families switch to rent subdivided flats because of limited vacancies in public housing estates

and thus have a very long waiting time, with an average of 6 years. These subdivided flats are of extremely limited size (132 ft² in average) and accommodate up to a family of four people, thereby restricting food storage during the pandemic. Furthermore, the food preparation areas inside subdivided flats are usually small and under-equipped. Household preparation of food is therefore sub-optimal. Undoubtedly, the abovementioned issues provoke worries concerning the household's food availability and use. Given the fact that a large proportion of low-income families are living in subdivided flats, a timely and comprehensive policy response is needed to alleviate food insecurity as the pandemic progresses.

In the present study, the food security status of divorced households was found to be less likely to be affected by the pandemic when compared with those in married households. The finding is in contrast with most previous studies that single-parent families are usually at higher risk of food insecurity.^{37,38} This result could be explained by the well-constructed social infrastructure present in Hong Kong. Enormous social service support is provided to divorced parents, and many low-income single-parent households receive CSSA. They are also eligible for applying special allowance, such as single-parent supplement, in addition to receiving maintenance payments from their ex-partner for raising children. These multiple sources of income could therefore buffer the potential financial impact of COVID-19, reinforcing

food security during the pandemic period. Given this positive example, and the fact that low-income families who are living in subdivided flats experienced exacerbated food insecurity, the government should consider the provision of appropriate subsidies as a means of temporal relief.

One objective of the present study was to investigate the exact dietary adaptations adopted by the surveyed participants. An extremely large proportion of low-income families forfeited their right to enjoy proper meals because of their lack of resources amid the COVID-19 pandemic, by practising various dietary adaptations to reduce their expenditure on foods. Thus, provision of practical tips to this population on how to shop and cook cheap yet nutritious and storable food, could prove a remedial solution to alleviate the current situation. In fact, previous studies showed that educational programs in urban and rural settings can effectively enhance food security status,^{39–41} thus providing the evidence and base for the development of such cooking tips. Special focus should be given to those adaptations that directly impact children's nutritional status, considering that as many as one fifth of them experienced a whole day of starvation due to financial constraints. Meanwhile, nearly half were forced to cut down their meal portions. As previously stated, even a short period of food insecurity in growing children increases the likelihood of long-term developmental, psychosocial, and emotional harm.⁸ Thus, a timely and comprehensive nutritional screening of possible at-risk cases and nutritional or clinical support are warranted.

The study has a few limitations. First, it predominantly looked into the accessibility and utilisation aspects of food security. According to the United Nations, the concept of food security also covers the aspect (pillar) of availability.⁴² Given the affluence of Hong Kong, food supply has been steady with high availability for decades. Therefore, the authors presumed the critical factors affecting household food security are economic accessibility and the use of food. This is consistent with the view from other studies that investigated food insecurity in affluent cities or areas. Second, considering the unpredictable nature of the research topic, the present study measured participants' pre-pandemic food security status by recalling the responses to the HFIAS back to November 2019. A previous study with similar design suggested that HFIAS questions are distinct and are not mixed or forgotten normally.⁴³ Nevertheless, the interpretation of results should always take this into account. Third, the use of nonprobability sampling in this study may introduce sampling bias. Given the hidden nature of low-income families, the participants were referred to the research team by Oxfam Hong Kong. They may not

represent all members of the low-income population, although they are located in one of the poorest districts in Hong Kong.

In summary, the exacerbation of food insecurity among low-income families during COVID-19, necessitates timely assessment and implementation of appropriate measures for preventing physiological harm to this population, particularly the vulnerable young members. The at-risk socio-economic factors revealed in this study could help to identify the neediest households and shed light on the direction for policy development. This study also highlighted the need for further research at the point when the COVID-19 pandemic is widely considered to have ended, to reveal the full impact of the pandemic on food security.

AUTHOR CONTRIBUTION

TKCY formulated the research questions, analysed the data, and wrote the manuscript. SYTT collected and analysed the data. DDST drafted survey questions and reviewed the manuscript.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Tony K. C. Yung  <https://orcid.org/0000-0002-5553-8807>

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