

# THE IMPACT OF PUBLIC HEALTH INTERVENTION POLICIES ON LOCALS' MOBILITY PATTERNS DURING THE FIRST HALF OF 2020

Pimtong Tavitiyaman\*<sup>1</sup>, Bill Xu<sup>1</sup>, Chloe Fung<sup>2</sup>

1. College of Professional and Continuing Education, The Hong Kong Polytechnic University, Hong Kong, China

2. School of Professional Education and Executive Development, The Hong Kong Polytechnic University, Hong Kong, China

Correspondence: pimtong.t@cpce-polyu.edu.hk

## ABSTRACT

### OBJECTIVE

The prevalence of coronavirus disease 2019 (COVID-19) can cause inconvenience and affect lifestyle because human movements can spread virus transmission. This study aims to investigate the impact of the government's public health intervention policies and reported COVID-19 cases on locals' mobility patterns.

### DESIGN

Secondary data on various mobility patterns of Hong Kong people against public health intervention policies and reported COVID-19 cases were collected and analyzed from publicly available sources, including government, commercial, and news sites. Data were collected from January to July 2020. Multiple regression was applied for hypothesis testing.

### RESULTS

Results showed positive and negative impacts of public health intervention policies and reported COVID-19 cases on locals' mobility patterns. The policy of wearing facial masks negatively influenced locals' mobility patterns. Then, the policy of closure of leisure and cultural service venues increases locals' mobility for retail, groceries, and transit. Moreover, the policy limiting social gatherings to 50 people enhanced locals' mobilities for retail and transit. From another aspect, the reported COVID-19 cases had a negative impact on locals' mobility for retail, parks, and transit.

### CONCLUSION

This study presents considerable effects of public health intervention policies. With the restrictions on certain activities or behaviors, locals will transfer to another behavior, which consequently enhances travel mobilities. The reported COVID-19 cases significantly reduced local mobility patterns.

### KEYWORDS

public health intervention policies, local mobility patterns, COVID-19, reported cases

## INTRODUCTION

A novel coronavirus disease, now known as COVID-19, emerged at the end of 2019 has spread globally at the beginning of 2020. Millions of people have fallen ill, and businesses have struggled to survive with strict measures, such as city lockdowns. The global tourism industry remains one of the most impacted sectors, which has suffered significantly because of travel restrictions and control. [1, 2] Restrictions on travel and mobility influence locals' behaviors and international tourist arrivals, thereby affecting the survival of businesses in the retail, tourism, and hospitality sectors.

Owing to the increase of reported COVID-19 cases globally, the governments of countries affected by the COVID-19 pandemic enact public health intervention initiatives to minimize COVID-19 transmission and people's mobility behaviors. Some rules include controlling international tourist arrivals, limiting the number of people for social gatherings, setting time for city lockdown, and seeking approval before making a business trip. These rules can prevent the disease from spreading to a certain extent. The prevention mechanism is doubted, and people are reluctant to follow the social distancing norms. Consequently, more rigid rules may be introduced, which can cause inconvenience to people psychologically and physically. Local businesses and enterprises will be affected by the constraints and limited mobility of locals.

Many researchers have used mobility data to investigate the effectiveness of government policies. [3, 4, 5, 6, 7, 8] However, a research gap still exists. Limited literature regarded the relationship between government policies and mobility data in the context of locals' behaviors and travel patterns. A case study on a densely populated city, such as Hong Kong, can provide new insight into understanding future enterprises' business recovery and new government policy initiatives. Moreover, Hong Kong's experience with the SARS outbreak in 2002–2004 implies the influence of locals' public health awareness and risk perception on mobility behaviors. Considering the different external environments, such as lack of trust in crisis response to COVID-19 in Hong Kong [9], this study explores how locals execute public health intervention initiatives with the new social distancing norms and practices initiated by the government.

This study aims to investigate the impact of the government's public health intervention policies and reported COVID-19 cases on locals' mobility patterns. The study contributes to the effectiveness of government policies and public gathering initiatives in implementing social distancing and prevention of disease transmission.

## LITERATURE REVIEW

### PUBLIC HEALTH INTERVENTION POLICIES

Public health intervention policies explain the mitigation strategies to suppress public transmission within a community. [10] During the development of a potential vaccine, non-pharmaceutical interventions (NPI) have been at the forefront to curb the spread of COVID-19. NPIs are described as "actions apart from getting vaccinated and taking medicine that people and communities can take to help slow the spread of illnesses." [11] Government policies implemented NPIs as a part of community mitigation strategies. Some examples of NPIs are travel bans, cancellations of social events, restrictions on gathering size, closure of public transport, school closures, work from home recommendations, and restriction on internal movement and international travel. [12] Restrictions on travel proved to be an effective early measure to limit the spread of the virus but were insufficient for its long-term containment. [13]

Social distancing, the act of keeping physical distance from others and limiting frequency and contact with others, has rapidly become a household term. Social distancing norms have changed locals' behaviors. Research has proven the effectiveness of social distancing as a crucial measure for controlling the spread of COVID-19. [4, 14] However, Zhang et al. argued that the effectiveness of social distancing strategies depends on other interventions to reduce transmission. [14] In Hong Kong, early quarantine that was enforced less than one day after the onset of symptoms has been identified as a crucial measure to inhibit the spread of the virus. [15] Limitations on the number of individuals gathering publicly due to public gathering policies) have been enforced to encourage social distancing. [9] Moreover, large gatherings and major public events were suspended or postponed. Dinner gathering after 6:00 pm was prohibited for a specified period.

## RELATIONSHIP BETWEEN PUBLIC HEALTH INTERVENTION POLICIES, REPORTED CASES, AND MOBILITY PATTERNS

Mobility measures the percentage change of a population's movement between spatial categories. The degree of self-restriction was consistently associated with the declines in all activities such as eat-out and leisure. [16] As the transmission of the virus occurs with close contact, reduced mobility in outdoor spaces is one way to reduce transmission and, ultimately, the reported COVID-19 cases. [8] Targeted lockdowns and closures of educational institutions have reduced mobility and virus transmission, with early closures of schools and universities resulting in a larger reduction in mobility and the reproductive number of the virus. [10]

In the literature, raw location data from commercial providers have been used to discover large reductions in mobility in the US, specifically in relation to certain government policies targeting the COVID-19 spread. [17] For instance, lockdowns were found to reduce outdoor mobility of citizens and thus virus transmission. [7, 17] Additionally, the policy of social distancing proved to be effective in restricting virus transmission owing to the reduced population mobility. [4, 6] This study aims to investigate the effectiveness of the government policies and local citizens' behaviors of mobility patterns. The following hypothesis is proposed:

*H1: Government public health intervention policies would reduce locals' mobility patterns.*

Mortality and death anxiety have been found to be positively related to outdoor mobility and negatively associated with more time spent at home. [18] With the updated number of people affected by COVID-19, people would avoid traveling in public areas, given the existing risk concerns. Thus, Hypothesis 2 is proposed as follows:

*H2: The increased number of reported COVID-19 cases would reduce locals' mobility patterns.*

## METHODOLOGY

### DATA COLLECTION AND PROCEDURE

This study focuses on Hong Kong owing to its position in the COVID-19 pandemic. The population density in Hong Kong is 6,940 persons per square kilometer of the land area. [19] Hong Kong, a densely populated city bordering Mainland China, reacted swiftly to the increasing spread of COVID-19.

Secondary data were collected and analyzed from publicly available sources, including government, commercial, and news sites. The composition of independent and dependent variables is explained below. The major independent variables are as follows: public health intervention policies—the policy timeline was constructed through individual news articles and categorized into seven main groups: (1) restaurant, (2) border, (3) quarantine, (4) face masks, (5) Leisure and Cultural Services Department (or LCSD; i.e., museums, sports, and public spaces), (6) entertainment (i.e., bars, cinemas, and karaoke venues), and (7) public gathering restrictions (e.g., 2–4, 8, and 50 people) and report COVID-19 cases. In the meantime, the dependent variable is local mobility pattern of various activities.

Policies involving restaurants included limitations on the maximum occupancy in the restaurant, hours for dining in, and restrictions on the number of people allowed per table. Border restrictions included the banning of individuals from entering Hong Kong on the basis of departure destination and residency. Quarantine policies involved the imposition of mandatory quarantine on individuals arriving from listed areas. Face mask policies required people to use face masks in stated areas. The LCSD is a governmental department, and policies under this category involve its managed facilities, including public libraries, museums, sports centers, and swimming pools. The entertainment group policies were related to the closure or restrictions of entertainment venues, such as bars, cinemas, and karaoke venues. Public gathering restrictions were coded and categorized into three groups that the government had issued in the time frame of the study. The caps of two and four people were combined into one category, with caps on 8 people and 50 people being the other two categories. The public gathering policy timeline was noted as a dummy coding (dummy code = 1, others = 0) when a certain cap on public gathering was in place.

The reported cases of COVID-19 were updated daily as public sector information by the Hong Kong government. The reported cases were logged from January 23 to July 31, 2020.

Locals' mobility patterns were sourced from the Google Community Mobility Reports (2020). [21] The dataset measured the daily percentage change of movement to various spatial categories compared with the baseline of the five weeks from January 3 to February 6, 2020. Spatial categories were grouped as follows: (1) retail and

recreation, (2) groceries and pharmacies, (3) parks, and (4) transit and stations. In particular, mobility data provided by Google were used in this study to evaluate the effectiveness of policies and locals' mobility [3, 5].

The news articles referenced were primarily from Hong Kong's public broadcasting service, Radio Television Hong Kong (RTHK) English News. [20] RTHK broadcasts with English articles were used in the creation of the policy timelines. Supplemental articles were sourced from the South China Morning Post, including international sources, such as Reuters and Al Jazeera. [22, 23, 24, 25] Policies regarding border control were also referenced through the continuously updating COVID-19 government resource website. The timeline begins on January 25, 2020 and runs until July 31, 2020. The timeline noted policy changes, including relaxation or restriction in policies, from their enforcement date. Data were coded according to the policy enforcement date rather than the announcement date.

## DATA ANALYSIS

For H1 and H2, multiple regression was employed to test the impact of various independent variables (e.g., six public health intervention policies and reported COVID-19 cases) on the dependent variable (mobility patterns to retail, groceries and pharmacies, parks, and transit). The multicollinearity testing of variance inflation factor (VIF) was performed. Most multiple regression equations met the accepted level of the multicollinearity test with the ranges between 1.02 and 1.88. [26] When running the multiple regression testing, the warnings showed that the independent variables (i.e., border, quarantine, and schools) were constants or had missing correlations.

## RESULTS

Table 1 presents the linear regression results on the influence of public health intervention policies and reported cases on locals' mobility patterns per spatial category. For retail mobility pattern, the variables of LCSD ( $\beta = 1.84$ ,  $t$ -value = 2.34,  $p < 0.05$ ), public gathering restrictions of 50 people ( $\beta = 10.75$ ,  $t$ -value = 3.32,  $p < 0.01$ ) as well as daily reported cases ( $\beta = -0.13$ ,  $t$ -value = -9.78,  $p < 0.01$ ) were statistically significant (adjusted  $R^2 = 0.86$ ,  $F$ -value = 144.62,  $p < 0.01$ , and Durbin-Watson test = 1.15). Furthermore, the public health intervention policies in terms of facial masks ( $\beta = -7.23$ ,  $t$ -value = -2.31,  $p < 0.05$ ), LCSD ( $\beta = 5.27$ ,  $t$ -value = 3.62,  $p < 0.01$ ), and daily reported cases ( $\beta = 0.09$ ,  $t$ -value = 3.53,  $p < 0.01$ ) had a significant effect on mobility patterns in groceries and pharmacies (adjusted  $R^2 = 0.44$ ,  $F$ -value = 19.84,  $p < 0.01$ , and Durbin-Watson test = 1.15).

Moreover, for mobility pattern to the parks, only daily reported cases ( $\beta = -0.20$ ,  $t$ -value = -4.51,  $p < 0.01$ ) affected mobility patterns in parks and outdoor spaces (adjusted  $R^2 = 0.30$ ,  $F$ -value = 11.30,  $p < 0.01$ , and Durbin-Watson test = 1.12). For transit areas and stations, the variables of LCSD ( $\beta = 4.41$ ,  $t$ -value = 4.09,  $p < 0.01$ ), public gathering restrictions of 50 people ( $\beta = 10.27$ ,  $t$ -value = 2.31,  $p < 0.05$ ) as well as the daily reported cases ( $\beta = -0.08$ ,  $t$ -value = -4.45,  $p < 0.01$ ) were statistically significant (adjusted  $R^2 = 0.72$ ,  $F$ -value = 62.62,  $p < 0.01$ , and Durbin-Watson test = 1.47). As a result, H1 and H2 were partially supported.

TABLE 1: IMPACT OF PUBLIC HEALTH INTERVENTION POLICIES AND REPORTED CASES

Independent variables	RETAIL			GROCERIES & PHARMACIES			PARKS			TRANSIT		
	Unstandardized coefficient		t-value	Unstandardized coefficient		t-value	Unstandardized coefficient		t-value	Unstandardized coefficient		t-value
	B	SE		B	SE		B	SE		B	SE	
(Constant)	-21.64	0.48	-45.06**	-6.59	0.89	-7.40**	-10.32	1.54	-6.69**	-27.69	0.66	-42.02**
Facemasks	-1.09	1.69	-0.64	-7.23	3.14	-2.31*	4.00	5.43	0.74	1.06	2.32	0.46
LCSD	1.84	0.79	2.34*	5.27	1.46	3.62**	-0.46	2.52	-0.18	4.41	1.08	4.09**
Entertainment	-0.91	3.08	-0.30	-3.07	5.71	-0.54	-15.17	9.89	-1.53	-4.04	4.22	-0.96
PG (2-4 pp)	-1.81	3.06	-0.59	6.65	5.68	1.17	12.15	9.82	1.24	-1.42	4.19	-0.34

PG (8 pp)	5.42	3.16	1.72	6.71	5.87	1.14	5.39	10.16	0.53	8.23	4.34	1.90
PG (50 pp)	10.75	3.24	3.32**	9.69	6.02	1.61	15.52	10.41	1.49	10.27	4.45	2.31*
Reported cases	-0.13	0.01	-9.78**	0.09	0.03	3.53**	-0.20	0.04	-4.51**	-0.08	0.02	-4.45**
Adjusted R <sup>2</sup>	0.86			0.44			0.30			0.72		
F-value	144.62**			19.84**			11.30**			62.62**		
Durbin-Watson	1.15			1.15			1.12			1.47		

\* p < 0.05, \*\* p < 0.01

LCSD = Leisure and Cultural Services Department, PG = Public gathering, pp = people

## DISCUSSION AND CONCLUSION

This study attempts to investigate the impact of public health intervention policies and reported COVID-19 cases on locals' mobility patterns. The results indicate evident evidence of the relationship between public health intervention policies and mobility patterns. Hong Kong residents have become increasingly alert to the social distancing norm. [4, 14] Their daily activities and behaviors have been changed accordingly. For instance, wearing masks and having hand sanitizer have become a normal practice. Furthermore, the facial mask policy reduces significantly the mobility of locals to groceries and pharmacies. This event might reflect the situation by which additional drugs and dispensaries are not highly needed because locals control their safety by wearing marks in indoor and outdoor areas.

Furthermore, closures of LCSD venues, such as public libraries and museums, enhance greatly the mobility toward retails, groceries and pharmacies, and transit. As a leisure choice of Hong Kong locals, shopping activities are common for all age groups. Residents may possibly be inclined to head toward retail outlets more than before, given the sudden closure of LCSD venues as a normal leisure destination choice. Many people may not have great risk concern because wearing marks and other health protection mechanism (e.g., temperature checking) is applied in retail stores. [16] In addition, the increase of transit mobility is explained as locals need to take the means of transportation for shopping and transporting the necessary goods and supplies. Last, limiting social gatherings in a stringent manner involving 2–4 people and 8 people maximum, seemed to have no significant impacts on the mobility patterns across various areas. However, relaxation to 50 people in the gathering

restriction actually positively stimulates the retail and transport mobilities. The prolonged nature of the stringent restrictions during the second wave in Hong Kong may have resulted in collective fatigue, thereby influencing increased retail and transport mobility during the easing of restrictions. [27] Many residents may thus like to hang out with a travel unit of much less than 50.

The reported cases of COVID-19 also significantly affect mobility patterns. Higher incidences of reported cases reduce mobility patterns in retail, parks, and transit but increase mobility in groceries and pharmacies and residential areas. These patterns largely reflect the reduced time spent in outdoor spaces and increased time spent at home, including stockpiling goods in response to crisis. The reported cases show the local citizens' risk perception and self-discipline, which can be an effective self-regulating factor. [28] Locals attempt to the behavior of stockpiling groceries and pharmaceutical items. [29, 30] Through these mobility and related purchase behaviors, they tend to perceive a mastery of control over their health and consumption activities to prepare for the future. In addition to individual risk perception, awareness of groups and social interaction somewhat limits outdoor mobility. [16] Individual-level behavior can outpace policy directives in some cases possibly because of increased media consumption and information networks. [4]

The battle with COVID-19 will remain until the vaccine is discovered, despite the upcoming new virus transmission. The evaluation and new initiatives of NPI strategies can be further investigated to ensure their effectiveness. The managerial implications are introduced as follows. The public health intervention policies have various effects on locals' mobility behaviors one way or another (positive and negative consequences). These policies should be developed and executed to gain optimal benefits with the



least negative impacts because they will have a direct and indirect effect on locals' daily work and lifestyle. For instance, the social distancing measures should encourage the locals' working and studying from home during the high COVID-19 infections and death rates. The duration of policy implementation can be regularly exercised to make adjustments where appropriate such as controlling the opening hours and number of visitor capacities of restaurants and public leisure and recreation facilities. Once the city small lockdowns and COVID-19 are controllable, the large-scale lockdowns can be further executed. [10] The government and organizations concerned should provide sufficient information to raise the locals' awareness and perception of COVID-19. Promoting the first, second, and third dose of COVID-19 vaccine is essential, especially for the locals who have not yet received any dose. Safeguard discipline of each individual should be reminded, and the compliance of everyone must be ensured.

## LIMITATIONS AND FUTURE RESEARCH

This study has limitations regarding the collection of secondary data. Analysis of percentage change in mobility compared with a baseline assumes the baseline as a norm and may overlook nuances in changes in seasons, public holidays, and other factors that influence human mobility. The period of data collection was until the end of July 2020. Limitations exist in the construction of the policy timeline as concurrent policies may have overlapping effects. Moreover, the nuances of mobility among extending, restricting, and relaxing a policy may have been diminished. [3] This study disregarded the interactions on human behavior in the gap between policy announcement and implementation, which can show another insight. [7] Furthermore, the inherently complex nature of human behavior in response to the pandemic involved sociodemographic factors, cultural and political contexts, and other factors that may influence the new insight. Future studies can explore a community survey to understand how mobility pattern of the population could be affected by public health policies during the pandemic. A comparison of the survey results conducted in different time points can also have important practical implications. Timely update with individuals' perceptions and attitudes as well as the effects of government policies as representing environmental factors is an important element in a longitudinal study.

## References

1. Abay KA, Tafere K, Woldemichael A. Winners and losers from COVID-19: Global evidence from Google search. World Bank Policy Research Working Paper 2020; 9268. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3617347](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3617347)
2. Nicola M, Alsafi Z, Sohrabin C, Kerwan A, Al-Jabir A, Iosifidis C, Agha M, Agha R. The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery* 2020; 78: 185–193.
3. Askitas N, Tatsiramos K, Verheyden B. Lockdown strategies, mobility patterns and COVID-19. ArXiv:2006.00531 [Physics, q-Bio] 2020. <http://arxiv.org/abs/2006.00531>
4. Badr HS, Du H, Marshall M, Dong E. Association between mobility patterns and COVID-19 transmission in the USA: A mathematical modelling study. *The Lancet Infectious Diseases* 2020; 20(11): 1-8.
5. Dela Cruz A. Forecasting Philippine residential mobility percentage change during COVID-19 (SSRN Scholarly Paper ID 3579517). *Social Science Research Network* 2020; 1-10.
6. Pepe E, Bajardi P, Gauvin L, Privitera F, Lake B, Cattulo C, Tizzoni M. COVID-19 outbreak response, a dataset to assess mobility changes in Italy following national lockdown. *Scientific Data* 2020; 7(1): 230.
7. Pullano G, Valdano E, Scarpa N, Rubrichi S, Colizza V. Population mobility reductions during COVID-19 epidemic in France under lockdown. *MedRxiv* 2020; 1-22.
8. Zhou Y, Xu R, Hu D, Yu Y, Li Q, Xia J. Effects of human mobility restrictions on the spread of COVID-19 in Shenzhen, China: A modelling study using mobile phone data. *The Lancet Digital Health* 2020; 2(8): e417–e424.
9. Hartley K, Jarvis DSL. Policymaking in a low-trust state: Legitimacy, state capacity, and responses to COVID-19 in Hong Kong. *Policy and Society* 2020; 39(3): 403–423.
10. Cuadrado C, Monsalves MJ, Gajardo J, Bertoglia MP, Najera M, Alfaro R, Canals M, Kaufman JS, Pena S. Impact of small-area lockdowns for the control of the COVID-19 pandemic. *MedRxiv* 2020; 1-17.
11. Centers of Disease Control and Prevention. Nonpharmaceutical interventions (NPIs). <https://www.cdc.gov/nonpharmaceutical-interventions/index.html>
12. Hale T, Angrist N, Kira B, Petherick A, Phillips T, Webster S. Variation in government responses to COVID-19

13. Aleta A, Hu Q, Ye J, Ji P, Moreno Y. A data-driven assessment of early travel restrictions related to the spreading of the novel COVID-19 within mainland China. *Chaos, Solitons & Fractals* 2020; 139: 110068.
14. Zhang J, Litvinova M, Liang Y, Wang Y, Wang W, Zhao S, Wu Q, Merler S, Viboud C, Vespignani A, Ajelli M, Yu H. Changes in contact patterns shape the dynamics of the COVID-19 outbreak in China. *Science* 2020; 368(6498): 1481–1486.
15. Yuan HY, Mao A, Han G, Yuan H, Pfeiffer D. Effectiveness of quarantine measure on transmission dynamics of COVID-19 in Hong Kong. *MedRxiv* 2020; 1–28.
16. Parady G, Taniguchi A, Takami K. Travel behavior changes during the COVID-19 pandemic in Japan: Analyzing the effects of risk perception and social influence on going-out self-restriction. *Transportation Research Interdisciplinary Perspectives* 2020; 7: 100181.
17. Warren MS, Skillman SW. Mobility changes in response to COVID-19. *ArXiv* 2020; 2003: 14228 [Cs].
18. Basellini U, Albrez-Gutierrez D, Del Fava E, Perrotta D, Bonetti M, Camarda CG, Zagheni E. Linking excess mortality to Google mobility data during the COVID-19 pandemic in England and Wales. *SocArXiv* 2020; 1–18.
19. Census and Statistics Department. Land area, mid-year population and population density by District Council district, 2019. <https://www.censtatd.gov.hk/hkstat/sub/sp150.jsp?productCode=D5320189>
20. Radio Television Hong Kong. English News (2020, July 31). <https://news.rthk.hk/rthk/en/>
21. The Google Community Mobility Reports. COVID-19 community mobility reports 2020. <https://www.google.com/covid19/mobility/>
22. Chan HH, Cheung G. Hong Kong schools, kindergartens closed until at least March 2 as coronavirus fears grow, three universities take similar action. *South China Morning Post* (2020, January 30). <https://www.scmp.com/news/hong-kong/education/article/3048305/hong-kong-universities-suspend-classes-until-march-china>
23. Lau C. China coronavirus: Hong Kong students face exam crunch as school year takes another hit after suspension caused by protests. *South China Morning Post* (2020, January 26). <https://www.scmp.com/news/hong-kong/education/article/3047662/china-coronavirus-hong-kong-students-face-exam-crunch>
24. Reuters Staff. Hong Kong bans restaurant dining as it battles new wave of coronavirus. *Reuters* (2020, July 27). <https://www.reuters.com/>
25. Al Jazeera. Timeline: How the new coronavirus spread. *Al Jazeera* (2020, July 31). <https://www.aljazeera.com/>
26. Hair JF Jr, Black WC, Babin BJ, Anderson RE, Tatham RL. *Multivariate data analysis*, 6th ed. New Jersey: Pearson Prentice Hall; 2006.
27. Cowling BJ, Ali ST, Ng TWY, Tsang TK, Li JCM, Fong MW, Liao Q, Kwan MYW, Lee SL, Chiu SS, Wu JT, Wu P, Leung GM. Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: An observational study. *The Lancet Public Health* 2020; 5(5): e279–e288.
28. Wan KM, Ho LKK, Wong NWM, Chiu A. Fighting COVID-19 in Hong Kong: The effects of community and social mobilization. *World Development* 2020; 134: 105055.
29. Arafat SMY, Kar SK, Marthoenis M, Sharma P, Apu EH, Kabir R. Psychological underpinning of panic buying during pandemic (COVID-19). *Psychiatry Research* 2020; 289: 113061.
30. Kostev K, Lauterbach S. Panic buying or good adherence? Increased pharmacy purchases of drugs from wholesalers in the last week prior to Covid-19 lockdown. *Journal of Psychiatric Research* 2020; 130: 19–21