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Visualizing the impact of Covid-19 vaccine passports on pedestrian access to metro stations in Hong Kong

Yingying Xu ^a, Dawei Cheng ^a, Ho-Yin Chan ^b and Anthony Chen ^{a,c}

ABSTRACT

Pedestrian infrastructures in Hong Kong enable multilevel city life in a vertical metropolis plagued by land scarcity. Public spaces integrated into pedestrian networks play an indispensable role in neighbourhood accessibility. We visualize the impact of the Covid-19 vaccine passport (VP) restrictions on the use of public space on pedestrian accessibility to all 97 metro stations in Hong Kong. Pedestrians without a vaccine passport (PwoVP) need to walk significantly longer alternative routes. Specifically, VP-related access restrictions to indoor walkways have doubled the shortest travel time for PwoVP and a 50% reduction in accessibility of two-thirds of stations.

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pedestrian accessibility; metro; Covid-19; vaccine passport; 3D pedestrian network; Hong Kong

JEL CLASSIFICATIONS

R41; R42

The sudden arrival of the fifth wave of Covid-19 in Hong Kong has resulted in one of the highest death and infection rates.¹ Consequently, a vaccine passport (VP) system² has been introduced for those who are fully immunized, resulting in only VP-carrying people being allowed to enter indoor public premises. Given the entanglements of indoor public spaces and pedestrian pathways in the multilevel city (Chan et al., 2022) and the substantial unvaccinated population,³ this article visualizes the impact of the VP system on pedestrian accessibility to metro stations.

We adopt a three-dimensional (3D) pedestrian network⁴ and perform a VP before-and-after analysis to identify the shortest travel time (STT) in 10-min walkable catchments from all 97 metro stations.⁵ For details of network data and walking speed assumptions,⁶ see Sun et al. (2021) and Xu et al. (2022), respectively.

We find that VP-related access restrictions to indoor walkways have doubled the STT for pedestrians without vaccine passports (PwoVP) and 50% reduction in accessibility of two-thirds of stations. The five most severely affected stations are Kowloon (KOW) (2.83), Kai Tak (KAT) (2.73), Lam Tin (LAT) (2.65), Tung Chung (TUC) (2.63) and Olympic (OLY) (2.62) (Figure 1a), with an array of mega-structures (e.g., shopping malls and housing estates) located above

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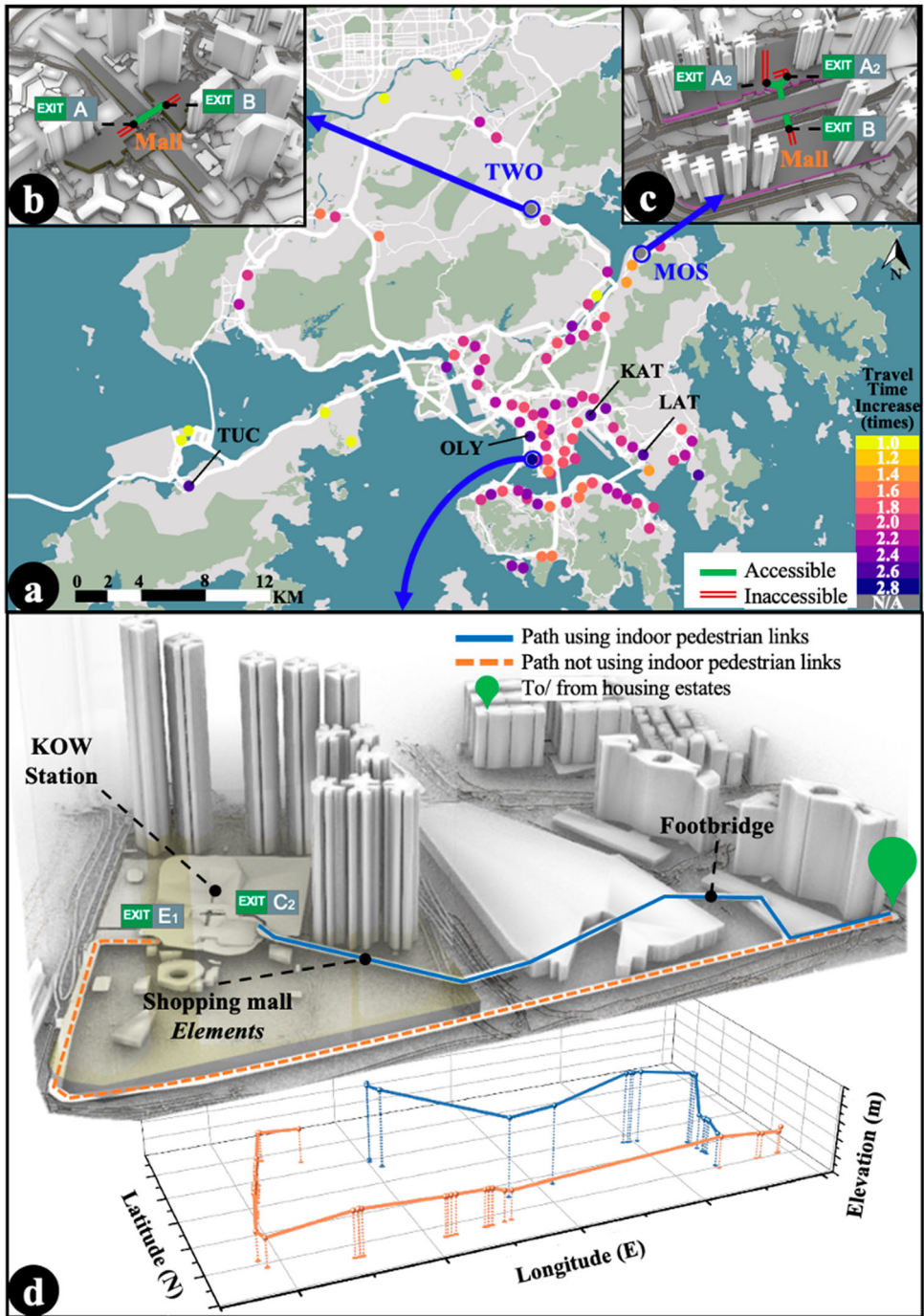


Figure 1. (a) Territory-wide impact of vaccine passport (VP) restrictions and selected cases of (b) Tai Wo (TWO), (c) Ma On Shan (MOS) and (d) Kowloon (KOW) station areas.

and around. In particular, Tai Wo (TWO) and Ma On Shan (MOS) stations (Figure 1b, c) are inaccessible to PwoVP, as all the exits are connected to indoor premises. Exemptions should be issued for allowing PwoVP to access alternative connectivity paths in and around these stations.

Furthermore, two important paths connecting exits E1 and C2 of KOW station are located inside the Elements mall. PwoVP must walk 460 m more to reach exits E1 or C2 (Figure 1d). Alternative paths are needed for PwoVP.

The results show that VP requirements significantly increase the walking time of PwoVP, particularly in areas where pedestrian passages are highly reliant on public spaces. As it may be some time before citizens in Hong Kong are vaccinated and some people cannot be vaccinated for medical reasons, these results demonstrate that the government should re-evaluate the effectiveness and fairness of the VP system, and exercise caution when introducing similar policies in restricting access to public spaces over the long term.

DISCLOSURE STATEMENT

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NOTES

¹ See <https://www.bloomberg.com/news/articles/2022-03-01/hong-kong-virus-deaths-amon-g-world-s-worst-on-at-risk-elderly/>.

² See https://www.news.gov.hk/eng/2022/02/20220208/20220208_180028_778.html/.

³ See <https://www.covidvaccine.gov.hk/en/>.

⁴ See <https://geodata.gov.hk/gs/dataset/201eaaee-47d6-42d0-ac81-19a430f63952/>.

⁵ Based on a regional survey in 2011, over 90% of trips take less than 10 min of walking time to access public transport in Hong Kong; see https://www.td.gov.hk/filemanager/en/content_4652/tcs2011_eng.pdf/.

⁶ The normal walking speed is set at 1.3 m/s, while it was adjusted on the slope encountered in the direction of travel according to Tobler's hiking function. Speeds of mechanized movements are based on the speeds of facilities (e.g., lifts, escalators and travelators).

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