

Variation in human mobility and its impact on the risk of future COVID-19 outbreaks in Taiwan

張孟群¹, Rebecca Kahn², 李育安¹, 李政昇¹, Caroline Buckee², 張筱涵¹

¹ 國立清華大學, ²Harvard T.H. Chan School of Public Health

Abstract

As COVID-19 continues to spread around the world, understanding how patterns of human mobility and connectivity affect outbreak dynamics, especially before outbreaks establish locally, is critical for informing response efforts. In Taiwan, most cases to date were imported or linked to imported cases. In collaboration with Facebook Data for Good, we characterized changes in movement patterns in Taiwan since February 2020, and built metapopulation models that incorporate human movement data to identify the high risk areas of disease spread and assess the potential effects of local travel restrictions in Taiwan. We found that mobility changed with the number of local cases in Taiwan in the past few months. For each city, we identified the most highly connected areas that may serve as sources of importation during an outbreak. We showed that the risk of an outbreak in Taiwan is enhanced if initial infections occur around holidays. Intracity travel reductions have a higher impact on the risk of an outbreak than intercity travel reductions, while intercity travel reductions can narrow the scope of the outbreak. The timing, duration, and level of travel reduction together determine the impact of travel reductions, and multiple combinations of these can result in similar impact. We developed an interactive application that allows users to vary inputs and assumptions and shows the spatial spread of the disease. Our results can be used readily if local transmission occurs in Taiwan after relaxation of border control, providing important insights into future disease surveillance and policies for travel restrictions.

Keyword: COVID-19, metapopulation model, mobility data, travel restrictions