



## Risk of tuberculosis in high-rise and high density dwellings: An exploratory spatial analysis



Poh-Chin Lai<sup>a,\*</sup>, Chien-Tat Low<sup>a</sup>, Wing-Sze Cindy Tse<sup>b</sup>, Chun-Kan Tsui<sup>c</sup>, Herman Lee<sup>d</sup>, Pak-Kwan Hui<sup>b</sup>

<sup>a</sup> Department of Geography, The University of Hong Kong, Pokfulam Road, Hong Kong

<sup>b</sup> Department of Pathology, Kwong Wah Hospital, Waterloo Road, Kowloon, Hong Kong

<sup>c</sup> Department of Medicine & Geriatrics, Kwong Wah Hospital, Waterloo Road, Kowloon, Hong Kong

<sup>d</sup> Information Technology Team, Kwong Wah Hospital, Waterloo Road, Kowloon, Hong Kong

### ARTICLE INFO

#### Article history:

Received 20 August 2012

Received in revised form

24 November 2012

Accepted 25 November 2012

#### Keywords:

Tuberculosis (TB)

Sky view factor (SVF)

Spatial analysis

Geographic information system (GIS)

Environmental health risk

### ABSTRACT

Studies have shown that socioeconomic and environmental factors have direct/indirect influences on TB. This research focuses on TB prevalence of Hong Kong in relation to its compact urban development comprising of high-rise and high-density residential dwellings caused by rapid population growth and limited land resources. It has been postulated that occupants living on higher levels of a building would benefit from better ventilation and direct sunlight and thus less likely to contract infectious respiratory diseases. On the contrary, those on lower floors amid the dense clusters of high-rises are more susceptible to TB infection because of poorer air quality from street-level pollution and lesser exposure to direct sunlight. However, there have not been published studies to support these claims. As TB continues to threaten public health in Hong Kong, this study seeks to understand the effects of housing development on TB occurrences in an urban setting.

© 2013 Elsevier Ltd. All rights reserved.

## 1. Introduction

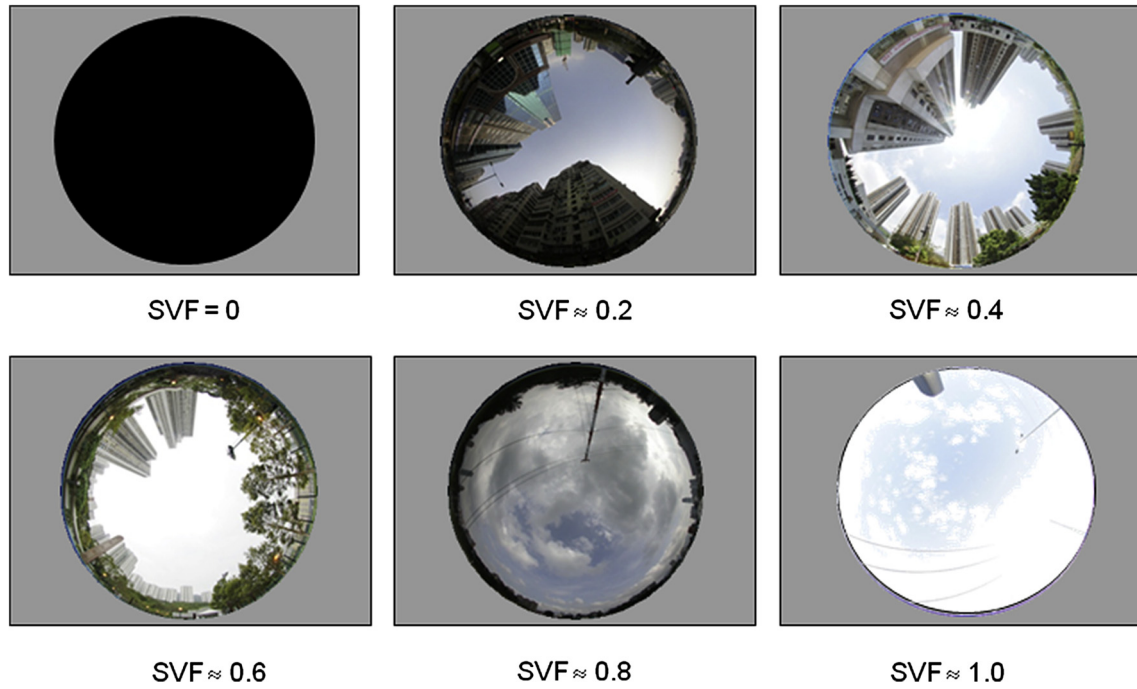
Tuberculosis (TB) is caused by *Mycobacterium tuberculosis*, a bacteria that often affects the lungs. Although TB is curable and preventable, it is highly contagious and spread from person to person through inhaling TB germs in the air. The World Health Organization (WHO, 2012) reported that the burden of TB remains enormous and is highest in Asia and Africa, with China and India accounting for almost 40% of the world's TB occurrences. Disease burden is the result of diverse environmental, social and behavioural risk factors. It has been estimated that more than 80% of the diseases regularly reported by the WHO have associated environmental risk factors (WHO, 2006). The same report also suggested that, except for HIV epidemic areas where environmental factors have a smaller effect, about 19% (ranging between 6 and 40%) of the total TB burden could be attributed to the environment. Given the strong environmental component of TB, it is clear that managing environmental risk factors could effectively reduce the disease burden. The World Health Organization (2005) considers Hong Kong as a region with

good health infrastructures that bears an intermediate burden of TB. TB prevalence in Hong Kong has been declining in the past 50 years (Department of Health, 2008) but it still remains a key health concern due to steady immigration and the compact living conditions. The disease has been found to have association with smoking (Leung et al., 2004) and HIV infection (Corbett et al., 2003). Areas dominated by the socially deprived (Lönnroth et al., 2009; Pang et al., 2010) and those living in crowded (Baker et al., 2008; Beggs et al., 2003; Lienhardt, 2001) areas of poor ventilation (Canadian Tuberculosis Committee, 2007; Hang et al., 2012; Li et al., 2007) have been reported to have noticeably higher TB prevalence.

Hong Kong has a compact urban built form comprising of high-rise and high density dwellings. This high density high-rise built form gives rise to an efficient transport infrastructure with low carbon consumption to which some researchers have accredited as a model of sustainable urban development (Lau et al., 2012). However, the compact city configuration is also criticized for its poor air quality and unpleasant living conditions that pose environmental health risks to its residents. Studies have shown that high-rise blocks constructed close to each other result in severe sky obstructions and poor air ventilation especially for the lower floors (D.H.W. Li et al., 2012). It is known that poor sunlight penetration, unsatisfactory air quality and impeded ventilation prevail in many urban communities of Hong Kong closely packed with mid-rise to

\* Corresponding author.

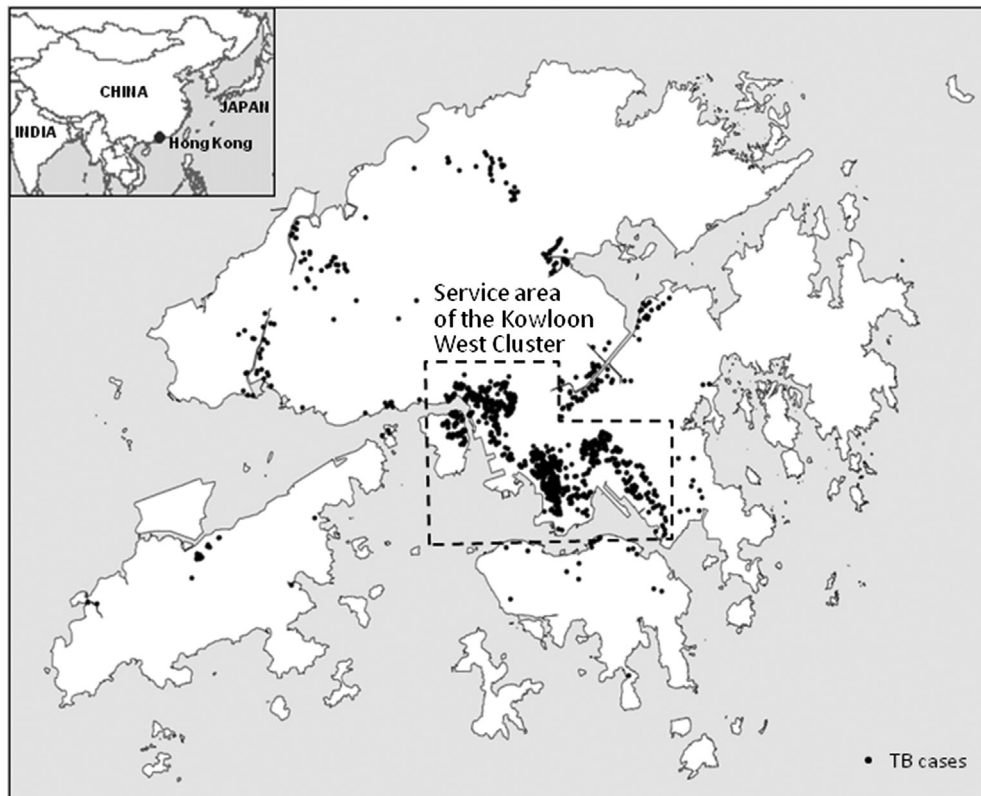
E-mail addresses: [pclai@hku.hk](mailto:pclai@hku.hk) (P.-C. Lai), [lowe\\_ctlow@hku.hk](mailto:lowe_ctlow@hku.hk) (C.-T. Low), [tsewsc@ha.org.hk](mailto:tsewsc@ha.org.hk) (W.-S.C. Tse), [albertcktsui@hotmail.com](mailto:albertcktsui@hotmail.com) (C.-K. Tsui), [leehwh@ha.org.hk](mailto:leehwh@ha.org.hk) (H. Lee), [pkhui@ha.org.hk](mailto:pkhui@ha.org.hk) (P.-K. Hui).



**Fig. 1.** Sample results of sky view factors (SVF). SVF ranges between 0 and 1, with near zero values indicating very little visible sky and values closer to 1 indicating no obstruction of the sky.

high-rise buildings (Edussuriya et al., 2011). It is also known that ultraviolet radiation from the sun kills bacterium in dwellings but the shading effects from surrounding buildings in many communities of Hong Kong have prevented direct sunlight to reach even pockets of small open spaces at the street level. Furthermore, the daylight quality within housing units are determined by many

factors, including window size, obstruction from other buildings, and distance between buildings (Lau, 2011). Because of short separation distances between buildings, windows facing neighbouring blocks are always fitted with window shades and kept closed most of the time thus defeating the purpose of bringing in light and ventilation.



**Fig. 2.** TB cases and the study area.

Download English Version:

<https://daneshyari.com/en/article/6318434>

Download Persian Version:

<https://daneshyari.com/article/6318434>

[Daneshyari.com](https://daneshyari.com)