



Neighbourhood effects on body constitution—A case study of Hong Kong



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ABSTRACT

Traditional Chinese Medicine (TCM) has long perceived environment as an integral part of the development of body constitution, which is a personal state of health closely related to disease presence. Despite of the ever-growing studies on the clinical effectiveness of TCM and the scientific linking between body constitution and diseases, the geographical influence on body constitution has yet remained an unexplored territory. This study sought to investigate whether the neighbourhood environment is relevant to the composition of body type of a population through statistical multilevel and Geographic Information Systems modelling. The analysis comprised 3277 participants who had completed their body type assessment between 2009 and 2012 inclusive. The multilevel analysis also took simultaneous accounts of both individual-level (gender, age, BMI, type of housing) and area-level (percent greenery, percent road surface, total road intersection, sky view factor, temperature, relative humidity, rainfall and social deprivation index) characteristics to explain geographical variation by body types. Significant random or place effects ($p < 0.001$) were identified in the multilevel models. The spatial variation of body constitution involved the dynamic interplay between individual and environmental factors. The findings amassed the first scientific indications to back the common belief that place does play a role in the development of body constitution and is worthy of further investigation. By considering spatial and personal attributes simultaneously, the study can yield valuable insights into the patterning of area variation in body constitution and disease presence.

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1. Introduction

Traditional Chinese Medicine (TCM), which has its roots in oriental philosophy and culture, is one of the oldest medical practices with a history of over 2000 years. This holistic medical system has developed through accumulating intelligence from ancient theories (such as the seminal text of TCM titled the “Yellow Emperor’s Inner Canon”) and daily life experiences, as well as continuous refining and experimenting by generations of practitioners. The complexity

of TCM theory and practice has made it one of the most original and controversial scientific achievements of the ancient Chinese civilisation. Contrary to contemporary western medicine (CWM) that emphasizes disease treatment as well as its clinical efficacy, the holistic approach of TCM emphasizes more on disease prevention through the restoration of syndromes (*zheng*) or “pathophysiological” status (Tsang et al., 2013). The practice of TCM includes a broad spectrum of treatment alternatives such as herbal medicine, tuina, qi gong, moxibustion, acupuncture and dietary therapy. TCM emerges as a complementary and alternative health approach since its integration with CWM in the 1950s, especially among the Chinese-speaking communities in Mainland China, Hong Kong, Taiwan and Singapore (Chung, 2011; Chung et al., 2014; Loh, 2009; Wong et al., 2014). The integrative approach is widely applied to treat diseases where the “one-drug-fits-all” approach of CWM is not particularly effective, such as allergy, certain types of arthritis, and different types of malignancies (Li et al., 2013; van der Greef et al., 2010; Wang et al., 2011b). The integration of TCM and

Abbreviations: BMI, Body mass index; CIHM, Centre of Integrated Health Management; CWM, Contemporary western medicine; GIS, Geographic Information System; ICC, Intraclass Correlation Coefficient; SDI, Social deprivation index; SVF, Sky view factor; TCM, Traditional Chinese Medicine.

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CWM has benefited not only the therapeutic processes of major medical illnesses in terms of efficacy but also in terms of reducing medication requirements and minimizing side effects (Efferth et al., 2007; Ling et al., 2014; Liu et al., 2011; Xu et al., 2006).

TCM has long observed personal wellbeing as a dynamic balance between human body and the environment. Body constitution, according to TCM, is an individual's personal state of health expressed in reference to body metabolism and susceptibility to pathogenic factors. The World Health Organisation (WHO, 2007) defines constitution as "... the characteristics of an individual, including structural and functional characteristics, temperament adaptability to environmental changes and susceptibility to diseases. It is relatively stable, being in part, genetically determined and in part, acquired". From the TCM perspective, body constitution is transient in nature and a disease may ensue when the inner harmony of a human body is disrupted in response to the external environment. The concept of body constitution is not exclusively unique to TCM and is synonymous with "prakriti" in Ayurvedic medicine practised in India (Bhushan et al., 2005; Chopra and Doiphode, 2002; Svoboda, 1996). There has been an emergence of various classification theories on individual differences through regularity in human life and health (Wang et al., 2011a). Different words such as temperament, personality, build, composition, nature, and constitution have been used by scholars from around the world (Caspi et al., 1997; Do et al., 2012; Hintsanen et al., 2012; Lerner, 1969; Lerner and Korn, 1972; Park et al., 2011).

Wang Qi proposed in the late 1970s the constitutional theory of TCM, accepted later in 2009 as the national standard of body constitution classification in China (China Association of Chinese Medicine, 2009; Wang, 2005). The English translation of TCM philosophy by Liu (2009) covering the oriental phenomena of Qi, and of Yin-Yang and the Five Elements provides a basic understanding to the physical constitution of body. More recently, Wang et al. (2011a) consolidated various research methods used in classifying body constitution, including philology, informatics, epidemiology, and molecular biology.

The constitutional theory establishes nine body types, namely Type A – Balance (Ping He), Type B – Qi Deficiency (Qi Xu), Type C – Yang Deficiency (Yang Xu), Type D – Yin Deficiency (Yin Xu), Type E – Phlegm Dampness (Tan Shi), Type F – Damp Heat (Shi Re), Type G – Blood Stagnation (Xue Yu), Type H – Qi Depression (Qi Yu) and Type I – Special Diathesis (Te Bing). Simply stated, type A is a balanced body constitution and highly valued in health preservation whereas the other eight body types are considered imbalanced or assuming pathological constitutions. It is impossible to describe in detail characteristics of the TCM body constitution. A general summary with illustrative examples for each body type is included in Table 1. Further accounts of the body constitution and its associated diseases are available in Low (2014).

The emergence of health geography has established progressive interests of the role of location, space and place in explaining spatial variation in health (Dummer, 2008; Kearns and Moon, 2002; Kearns and Joseph, 1993; Smyth, 2008). The place effect on body constitution is widely recognized in TCM but has largely remained an equivocal statement or anecdotal evidence. The constitutional theory and health geography do overlap at significant points because both fields reckon that the environment or geographical settings have an influence on human health (Wang, 1995). Despite a plethora of literature attributing place effects on health, there remains a shortage of scientific and evidence-based studies linking place effects or environmental factors with TCM body constitution. Discussions on place effects not only have been theoretical and increasingly taken for granted by many TCM researchers but also descriptive and vague in nature (He et al., 1986; Huang, 2001; Xue, 2006). Moreover, these studies did not explicitly "measure" the

influence of place of living on body constitution so much so that place effects have remained speculative and a grey area in literature to date. The philosophical differences between TCM and mainstream western medicine make TCM difficult to comprehend and generalise. Furthermore, TCM terminologies often do not have western medicine counterparts and the medical probes are difficult to grasp (Tsang et al., 2013). For example, there is no equivalent anatomical organ or function in western medicine to describe the functional entity of "zang-fu" in TCM that encompasses multiple organs (including heart, liver, spleen, lungs and kidneys).

Present day TCM studies are mainly about clinical efficacy. This study is the first attempt to incorporate health geography and body constitutional theory in investigating the interconnectedness between health and the place of residence. The research hypothesis is that the place of residence has a "neighbourhood effect" on the TCM concept of body constitution. Drawing on precedents from neighbourhood effects research on health (Diez Roux, 2001; Pickett and Pearl, 2001), this study assumed neighbourhoods to be an actual census subdivision at the level of street-block group for hypothesis testing in multilevel analysis. The street-block group is the smallest census tract demarcated by streets and measures an average size of 0.22 km² with a minimum of 400 residents (Census and Statistics Department, 2011). It is widely known that the physical environment and social conditions in Hong Kong can vary a great deal within a short distance because of its limited land and high-density vertical development. A street-block is small enough to enclose similar housing types or housing estates to accommodate people of rather similar socio-economic status (Low et al., 2013). This smallest census unit can ensure homogeneity of the neighbourhood unit in terms of reduced environmental and socio-economic variability. The study also employed a Geographic Information System (GIS) and explored cartographic visualisation methods to highlight spatial association between specific environmental factors and body constitution. Given that body constitution can offer signals about the personal state of health and susceptibility to pathogenic factors, an understanding of the relationships between environmental factors and body constitution would contribute to a more proactive, holistic and individualized healthcare.

2. Data and method

2.1. Data and study area

The body constitution data in this study came from the Wilson T.S. Wang Centre of Integrated Health Management (CIHM) of the Kwong Wah Hospital, which is the only subsidiary hospital in Hong Kong providing comprehensive TCM integrated services that include an assessment test of body constitution. Ethical approval KW/EX-11-100 (42-04)(TCM) has been obtained from the Kowloon West Cluster Clinical Research Ethics Committee to undertake the study. 3277 voluntary attendees of the CIHM between 2009 and 2012 inclusive consented to participate in the study. As body constitution assessment was conducted on a voluntary and user pay basis (at a nominal rate of HKD200), these study participants were not random and represented individuals who were self-conscious about their health status or suffering from certain illnesses and seeking alternative remedy.

The participants comprised mostly of middle-aged Chinese descendants living within the catchment areas of Kowloon West Cluster, Kowloon Central Cluster and Kowloon East Cluster catchment areas (Fig. 1). Taking into consideration of travel cost and time, it is expected that a hospital-based sampling would likely succumb to sampling bias. Despite the exclusive provision of body constitution assessment at the CIHM, our sample showed that there

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