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Unequal spatial accessibility of integration-promoting resources and immigrant health: A mixed-methods approach

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1. Background

Successful integration of immigrants in the domain of health is vital to the well-being of immigrant communities and the larger society. Canada is a major hub of international migrants around the world. About 20.6% of Canada's population in 2011 are foreign born, and visible minorities represent 19.1% of the country's population (National Household Survey, 2011). Immigrants, many of which live in low-income neighbourhoods, account for two-thirds of Canada's population growth. There exists vast disparities in health between immigrant and non-immigrant populations and among various immigrant groups. The "healthy immigrant effect" describes the general health advantage of recent immigrants compared to native-born population, and the subsequent significant decline in health status among immigrants as the length of residency increases (Dunn & Dyck, 2000; Biddle, Kennedy, & McDonald, 2007; Newbold, 2005, 2011). Specific ethnic groups may experience various poor health outcomes, for example, there is a higher risk of diabetes mellitus, heart disease, stroke and hypertension among South Asians, and a higher risk of hypertension and stroke in the African population in Canada (Chiu, Maclagan, Tu, & Shah, 2015a).

In explaining the health inequalities among immigrants, many studies adapt the framework of the "social determinants of health" to examine how socioeconomic status (SES), lifestyle behaviour, social network and inclusion, sense of belonging and other factors influence immigrant health and contribute to a "healthy immigrant effect" (Newbold, 2011; Setia, Lynch, Abrahamowicz, Tousignant, & Quesnel-Vallee, 2011). A geographical perspective is yet to be fully incorporated in this body of literature. On the other hand, research shows considerable evidence of the place effect on health including immigrant health (Diez Roux & Mair, 2010; McLafferty, Widener, Chakrabarti, & Grady, 2012). Geographical variation in health can be explained by both compositional effects resulting from differences in individuals (which represent many of the well-studied social determinants of health), and contextual effects reflecting different physical and social attributes of a neighbourhood. Neighbourhood built environment, such as walkability and access to amenities, residential density, street connectivity, crime and safety, land-use mix, ethnic concentration, has the potential to promote or negatively affect health outcomes such as diabetes (Cerin, Saelens, Sallis, & Frank, 2006; Chiu, Shah, et al., 2015b; Raine et al., 2008; Renalds, Smith, & Hale, 2010; Wijk, Groeniger, van Lenthe, & Kamphuis, 2017). Despite the increasing scholarship on neighbourhood and health, relatively little attention has been placed on immigrants and ethnic minorities, with the exception of a small body of literature that examines the influence of built environment on physical activity and health among ethnic minorities (Brewer & Kimbro, 2014; Brown et al., 2013; Dai, 2011; Oluyomi et al., 2014; Perez, Nie, Ardern, Radhu, & Ritvo, 2013). Booth et al. (2013) suggests neighbourhood walkability as a strong predictor of diabetes incidence for immigrants in Toronto independent of age and neighbourhood income.

A few gaps in the literature are evident. Firstly, a limited number of studies have integrated neighbourhood characteristics and the traditional social determinants of immigrant health, and they generally focus on the socioeconomic condition of neighbourhood such as deprivation and ethnic concentration (Matheson, Moineddin, & Glazier, 2008; O'Campo et al., 2015; Wang & Hu, 2013). Secondly, country-specific ethnic groups are under-studied in research on neighbourhood environment and health, although a promising starting point is set in Oluyomi et al. (2014) and Brown et al. (2013) that explore the walk score and physical activity among Cuban and Mexican immigrant in the US. Thirdly, the uncertain geographic context problem (UGCoP) is particularly striking and noticeable when examining immigrant health and neighbourhood. The UGCoP questions the effects of area-based attributes that could be affected by how contextual units are geographically delineated (Kwan, 2012a,b). Immigrants and newcomers may have individual activity spaces and social networks that go beyond administratively defined areas, leading to a difference in measured (or potential) and perceived (or reported) access to neighbourhood amenities (Bissonnette, Wilson, Bell, & Shah, 2012; Joseph & Bantock, 1982; Joseph & Phillips, 1984; Wang & Hu, 2013). For example, immigrants are found to have a strong preference for culturally-appropriate healthcare and travel a long distance to access same-language physicians (Asanin & Wilson, 2008; Wang & Kwak, 2015; Wang, Rosenberg, & Lo, 2008).

Given the context, this study seeks to examine the post-migration health status of Sri Lankan immigrants in the Toronto Census Metropolitan Area (CMA) and their neighbourhood environment, characterized by access to key integration-promoting resources (IPRs). Sri Lankan is the third largest South Asian communities in Canada,

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following India and Pakistan. Among different South Asian subgroups, Sri Lankans are particularly vulnerable and are more susceptible to specific diseases and mental disorders due to the traumatic events experienced and resettlement stress related to their refugee experience (Beiser, Goodwill, Albanese, McShane, & Kanthasamy, 2015; Chiswick, Lee, & Miller, 2008). In the study, a mixed-methods approach is employed combining focus groups and spatial-quantitative methods to analyze a wide range of primary and secondary datasets. The study first investigates the lived experiences of Sri Lankan immigrants in managing health and accessing neighbourhood amenities, followed by analyses of inequalities in accessibility to select IPRs. The potential and perceived accessibility of IPRs are then cross-examined in relation to qualitative accounts of interviewees on their lived experiences. The study focuses on three types of IPRs: Tamil-speaking primary care physicians (PCP), South Asian grocery stores, and green space including parks and recreational space. Green space, a widely-studied built environment attribute, is known to have an effect to promote physical activity and improve physical and mental health (Sugiyama, Leslie, Giles-Corti, & Owen, 2008). Previous studies indicate that immigrants experience strong barriers in accessing linguistically-matched PCPs and receiving quality healthcare (Shah, Bell, & Wilson, 2016). Access to ethnic grocery stores is a key component of the food environment for ethno-racial minorities and influences the ways in which healthy foods are obtained (Lo & Wang, 2012; Wang & Hernandez, 2017).

2. Study area and study population

The study focuses on first generation immigrants from Sri Lanka residing in the Toronto (CMA), a highly culturally-diverse urban centre and home to 37% of Canada's immigrant population. Immigrants account for 46% of the CMA's total population. Ethnic minorities in Toronto increased by 20% from 2006 to 2011 (Statistics Canada, 2011). South Asian is the largest ethnic minority group in Canada, with 53.2% residing in the Toronto CMA. Immigrants from Sri Lanka account for 1.8% of the CMA's population. Most Sri Lankans migrated to Canada under the humanitarian category as refugees, and are primarily Tamil-speaking. South Asian immigrants living in western cities are found to have higher prevalence rates in long-term health problems compared to other ethno-racial groups (e.g., low self-rated health status, cardiovascular complications and diabetes) (Chiu, Austin, Manuel, & Tu, 2010; Chiu, Maclagan, et al., 2015a; Shah et al., 2013; Vyas, Chaudhary, Ramiah, & Landry, 2012; Wang, 2014). Sri Lankans in western countries such as Norway and USA are found to have disproportionally high prevalence rates in type 2 diabetes, cardiovascular diseases and high psychological distress levels (Beiser, Simich, Pandalangat, Nowakowski, & Tian, 2011; George & Jettner, 2016; Hyman et al., 2011; Katulanda, Ranasinghe, Jayawardana, Sheriff, & Matthews,2012; Tennakoon, Kumar, Nugegoda, & Meyer, 2010). The study provides critical insights into the post-migration health-related experiences of Sri Lankan immigrants in Canada, which is often masked by the crude south Asian category that fails to distinguish among country-specific sub groups.

3. Data and methods

The mixed-method approach largely follows a sequential design in terms of time orientation, with qualitative phase taking place prior to the quantitative phase (Leech & Onwuegbuzie, 2009). Eight focus groups were conducted, designed to encompass individuals differing in socioeconomic status, length of residency in Canada, immigrant trajectory and different neighborhoods where Sri Lankan immigrants are clustered and more dispersed. Ethical approval was obtained prior to the start of the fieldwork from the Research Ethics Board at the author's institution. A total of 45 participants were recruited using snowball sampling. Key informants and community organizations played an important role in reaching the target population. All focus groups were conducted in Tamil, the group's native language. The focus groups were audio recorded and were transcribed verbatim in English. Each session lasted between 90 and 120 min. Good rapport between the moderator and participants was achieved in all focus groups. Following the grounded theory approach (Creswell, 2007), focus group data were first analyzed in the open coding stage to generate themes (or categories) related to health, integration, neighbourhood environment and access barriers. Subthemes such as those related to how various types of IRPs influence health and health behaviour were further identified within each theme. Axial coding was then used to identify a hierarchy and relationships among subthemes. Once the themes and subthemes were identified, the transcripts were further analyzed to retrieve specific quotes and information in order to connect the themes/subthemes in the stage of selective coding. Given the small number of transcripts, focus groups data were analyzed manually using a cut-and-paste technique in Microsoft Word without relying on specialized software (Peace & van Hoven, 2010).

Various types of IRPs emerged from the focus groups as important neighbourhood characteristics influencing the health and integration of the participants. The related quantitative data are acquired from various sources to support the analyses in the subsequent quantitative phase. The PCP dataset is obtained from the Canadian Medical Directory (2011) that has information on the postal code location, languages spoken by physician and specialty of physicians. Data on the location, ethnicity and size of grocery businesses is collected through fieldwork in reference with the data provided by a research centre (name removed for peer review process). Data on green space (e.g., parks and recreational space) is retrieved from the land-use dataset from DMTI Spatial (2011) that also provides the street network file. Census Plus (2011) provides information on the residential location of Sri Lankans at a census tract level.

Potential access to IPRs is analyzed by using the two-step floating catchment area (2SFCA) accessibility measure. The 2SFCA method and its variations and refinements have been used widely as a reliable measure of spatial accessibility of service providers such as physicians, pharmacies, healthcare facilities and schools (Bauer & Groneberg, 2016; Donohoe et al., 2016; Li, Wang, & Xiao, 2017; Luo & Qi, 2009; Luo & Whippo, 2012; McGrail, 2012; McGrail & Humphreys, 2009; Wang & Onega, 2015; Williams & Wang, 2014). The 2SFCA model was first put forward by Luo and Wang (2003). It is a simpler version of the modified gravity accessibility model based on the original Hansen-type gravity model (Hansen, 1959), easier to implement in a GIS. The 2SFCA model replaces the continuous distance impedance function used in the gravity model with a dichotomous travel impedance that is predefined by travel threshold or service catchment area.

$$R_j = S_j / \sum_{k \in (d_{kj} \le d_0)} P_k \quad \text{(Step 1)}$$

$$A_i^F = \sum_{j \in (d_{ij} \le d_0)} R_j \quad \text{(Step 2)}$$

where A_i^F is the accessibility at census tract i to IPR, d_{ij} is the street network-based travel distance between i and j, S_j measures the service capacity of IPR at j. R_j is the resource-to-population ratio at IPR location j, which is within the travel threshold d_o from i. Calculation of 2SFCA accessibility involves two steps (see Wang & Luo, 2005, Wang, 2012, for a detailed illustration). In step one, for each IPR location, resource-to-population ratio R_i for centroids that fall within the IPR catchment area is computed. R_j reflects the degree of competitiveness for IPRs. In step two, for each census tract centroid, all the resource-to-population ratios (R_j) associated with all IPR locations within the travel threshold are summed up to compute the accessibility index at a census tract level. Service capacity (S_j) is measured differently - by number of Tamil-speaking PCPs from the same location, floor area of grocery stores and area of green space – for different IPRs. The 2SFCA model is repeated for each IPR type. An 8-km shortest network distance is used as the