Introduction

“Food security exists when all people in a household, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life,” according to Health Canada. Food retail environment is one measurement of physical food access. A community with healthy food retail environment is one surrounded by retailers selling fresh fruit, vegetables, and other whole foods, rather than pre-packaged food. These retailers include grocery stores, farmers’ markets, and other specialty produce stores (e.g. bakeries, butchers, etc.). According to a methodology review conducted by Charreire et al., geographic information system (GIS) methods are applicable and innovative approaches to determine the physical availability and proximity of food outlets, which supports the validation of this project.

In 2014, the City of Vancouver launched the “Healthy City for All” campaign to advocate equal access to high-quality community waterfronts. The goal is to increase the 23% Vancouverites in accessing services by 2023. A baseline analysis of the current healthy food retailer (HFR) service coverage was conducted using HFR data in 2016 and Canadian Census 2011. It shows that 499,834 (60.26%) Vancouverites are living within a 500m walking distance to a HFR (Figure 1). Despite the high coverage percentage, there are still 355,217 people unserved. Additionally, the population in Vancouver has increased rapidly since 2011, so the total number of unserved people could be higher. As a pioneer in public health, Vancouver still needs to close the gaps in HFR accessibility via walking, biking, or public transportation, in the spirit of equity.

This GIS project is aiming to develop and analyze the validity of a geospatial model in the determination of gaps in healthy food retailer access without a car, and to propose potential locations to fall in the gaps, in Vancouver, BC, Canada.

Methods

Walkability

A common walking distance used in GIS analysis is 1000m. However, given the considerations that a) walking with groceries takes extra effort, b) Vancouver has more than half-year rainy season, the walkability distance in this project is set as 500 meters.

Model Development

There are many aspects to consider in identifying and filling in the gaps of healthy food retail access. However, only five criteria were included in this model (Table on the right).

Within commercial zoning districts and near bikeways were required criteria. A raster cell size of 10m*10m was used for existing HFR density, population density, and Euclidean distance to public transit stops. A score of 0-2 was assigned to raster cells for criteria B, C, & D, where 0 means “not an ideal location for new HFR”, 1 means “less ideal”, and 2 means “very ideal” (Table). The calculation of total score is shown in the Table. At the end, two new HFR locations were chosen based on their distance to the nearest bikeways.

Evaluation of the model

There are quantitative and qualitative approaches to evaluate the model. The population under service coverage after the addition of the HFR determined in the model will be compared to the baseline. The 1000m service area is created through road distance network analysis. The qualitative evaluation includes result comparison with other literature on this topic and the discussing limitations of this model.

Results

Figures 2 to 3 show the intermediate results for each criterion in the model. The total scores assigned to each raster cell range from 4 to 8 (Figure 6). “4” means eligible areas with satisfied HFA access, and “8” means eligible areas with gaps of access. As predicted, the gap of healthy food access is not huge. Only a few locations got the full score (dark purple). Two 8-score locations are close to bikeways and therefore determined as the most ideal location for new HFR establishments. A building environment is shown in the two pop-up windows, suggesting new grocery stores are feasible there.

By adding these two new food retailers, the total population with non-driving access to healthy food retailers will increase from 499,834 to 516,927 (8.5%). 17,003 more residents in Vancouver will gain economic access.

Conclusion

Overall, this model is a simplified approach to identify the gaps of healthy food access and will underestimate Vancouver’s problem of accessing healthy food retailers by means other than driving. Future study is recommended to build on this model and take into consideration of the produces diversity and expand the study area.

References


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Data Sources: Bikeway, City of Vancouver Open Data, 2016; Healthy Food Retailers, Vancouver Coastal Health, 2016; Hydrography, DataBC, 2011; Population Density by Dissemination Block, DataBC, 2011; Public Transit Stops, Translink BC, 2016; Roads, DMTI Spatial Inc., 2014; Zoning Districts, City of Vancouver Open Data, 2016