Ideal Living for Senior Citizens Without Access to Mobile Vehicles

UBC GEOB 270 Lucia Bawagan Lab 2B Vivian Hau Lab 2D Michelle Lam Lab 2B

<u>Abstract</u>

This project outlines areas that would be ideal for senior citizens to live a comfortable and socially-active lifestyle without needing access to a car. Areas ideal for this kind of living should be accessible to general public facilities that cater to needs for health and entertainment at a reasonable walking distance. Namely, these include public transit and recreational facilities like parks, community centers, and libraries that encourage day-to-day community involvement, schools to possibly accommodate grandchildren, and hospitals to cater to any health concerns.

Our analysis defines the 'convenience' of an area according to its accessibility to the general facilities mentioned above. That is, ranking areas of Vancouver with any level of convenience lower than the highest would be within the proximity of less than all of the above facilities.

We found convenient areas of living for mobile senior citizens without cars and classified their convenience by their proximity to a number of the public service facilities mentioned above and calculated the percentage of Vancouver that is covered by each convenience rank: highest, high, moderately high, moderately low, low, and lowest convenience.

Project Description

In this project, we want to find the ideal living areas for the elderly population in the City of Vancouver. These areas would provide senior citizens with easy and timely access to certain public service facilities through walking or riding the SkyTrain, rather than driving mobile vehicles for themselves. We ranked the convenience levels by looking at the number of public facilities in the area. The areas with the greatest convenience include hospitals, SkyTrain stations, schools, community centers, parks, and libraries within a walkable distance. In our analysis, we decided that hospitals and SkyTrain stations should be present in all areas with a convenience ranking except for the lowest convenience level which does not contain the necessary intersecting facilities. Hospitals are necessary because it would be safer for senior citizens to go to and from the hospitals for medical services in a short period of time. We also thought that SkyTrain stations must be close by because SkyTrains will allow them to travel far in the short period of time, making it a necessity for people that do not drive. Other facilities we included were parks, community centers, and libraries. These are places that senior citizens may want to spend time at. We also included schools because they may have grandchildren that they can bring to and from school when parents are busy. All the facilities data were updated in 2009. The SkyTrain stations are up to date. We are focusing on the City of Vancouver because it is

densely populated with a rapidly growing housing market. Most of the data is from the City of Vancouver data catalogue.

Methodology of Analysis

Using ESRI's ArcMap, we were able to extract data for categories of land use in the City of Vancouver by clipping the land use data layer with the Vancouver city boundary (VancouverMask), with Landuse_Clip as the output feature. In the Landuse_Clip attribute table, we 'select by attribute' the residential areas, and exported this into a separate layer, Residential_Areas. We then clipped the healthcare data using Vancouver_mask to find healthcare facilities in Vancouver and exported the data separately to create a new layer, Healthcare_Clip. The Healthcare_Clip, included facilities like nursing homes and care centers which we do not need. We are assuming that the elderly population we are making this report for are living outside of nursing homes and care centers. There were no attributes to differentiate these facilities from hospitals so we manually selected hospitals in the attribute table of Healthcare_Clip to exclude other healthcare facilities from the analysis. Then we exported the data to a separate layer as Hospitals.

Because convenient areas would be within walking distance of the facilities, it was assumed that 800 meters would be a reasonable distance for senior citizens to walk in a reasonable amount of time and 1000 meters for senior citizens to conveniently get to and from hospitals in various ways. Therefore, we buffered schools, libraries, community centers, parks, and transit stations by 800 meters and hospitals by 1000 meters assuming some form of transit would be taken in the event of a medical emergency (i.e. ambulance, taxi, carpool pickup). We then changed the transparency of buffered layers to 50% to get a general idea of how the layers intersected on the map.

We categorize areas by their level of convenience according to the number of the facility buffers that intersect: wherein areas of highest convenience will be those within all facility buffers and areas of lowest convenience will not be within any of the buffers. First, we intersected Hospitals, Stations_Buffer, and Residential areas, and called the layer MustHave. We need this data for every convenience level except for 'lowest convenience'. Then we intersected all buffered layers and MustHave to find the most convenient residential areas for senior citizens. This is the 'highest convenience' level. For areas of relatively lower convenience, some facilities will be excluded from the data layer. Areas with the second highest convenience would be within the proximity of any combination of the facilities except one. We intersected buffered facilities (schools, parks, libraries, and community centers) layers and MustHave according to different combinations of the facilities, excluding one facility type every time, and created a total of 4 layers (ex. one layer will not contain the school buffer and another would not contain the park buffer and so on). Then we dissolved each combination and then union these layers with output feature as 'high convenience.' To make the 'moderately high convenience' level, we intersected the buffered facilities layers and MustHave according to different combinations of the facilities, excluding any two facilities per combination. Then we dissolved each combination and unioned a total of 6 layers as 'moderately high convenience.' To make the 'moderately low convenience' level, we intersected one facility buffer layer (i.e. exclude 3) per combination with MustHave, then dissolved each combination and unioned the layers and called it 'moderately low convenience'. 'Low convenience' is the same as the MustHave layer, containing the intersected Hospitals, Residential_Areas, and SkyTrain stations. All other residential areas outside the proximity of all of intersecting facilities are categorized as 'lowest convenience'. We then calculated the percentage of the total residential area that each convenience ranking covers. To do this we just dissolved each category of convenience. We also had to remember that each category was stacked on top of each other. So we had to subtract the area of the corresponding above category from the one we are interested in.

Discussion and Results ~1500

We found that out of all residential areas in the City of Vancouver, most of it was considered to be very low convenience, 92.9%. 0.78% was considered to be very high convenience, 3.8% was high convenience, 2.2% was moderately high convenience, 0.17% was moderately low convenience, and 0.07% was considered low convenience. Although these numbers were much lower than we expected, they are justified by our criteria for convenient living spaces as defined by their proximity to select public service facilities. Albeit our criteria for defining these convenience areas may be too limited in representing the convenience of Vancouver areas by the connectivity between different land use areas: for example, commercial areas that could include restaurants, retail, and manufacturing facilities and other transit routes. By making hospitals and SkyTrain stations within reasonable distances mandatory features in our convenience analysis, we retain the concept of convenience by the area's accessibility to medical care and transport as needed services separate from luxury type services provided by entertainment facilities. This criteria probably limited many potential convenient living areas.

Our prediction was partly supported by our analysis in that areas of varying degrees of convenience were found along specifically the Canada Line SkyTrain route. This is because SkyTrain stations were used in our analysis as one of the main facilities, along with hospitals, that would be found in every convenience area above 'lowest convenience'. Although the map shows more public service facilities in the east side of Vancouver, they are located far from the skytrain stations and hospitals. Hence, convenient areas were not detected since these facilities were not close enough to our main facilities, SkyTrain stations and hospitals. This does not mean that the facility buffers for these areas do not intersect at all. They may have intersected with each other but they were not within the proximity of the SkyTrain stations and hospitals, the main feature in our definition of a convenience area. SkyTrains allow people to travel far in a

fairly short amount of time so it would be reasonable to think that more public facilities would be situated around these travel centers. This may explain why there are so many convenient areas on our map around the Canada Line SkyTrain route. The lack of convenient areas on the map around the Expo and Millennium lines are mainly due to the lack of hospitals within their buffer zones.

We expected that the convenience of various areas would be distributed more or less evenly throughout both the east and west sides of Vancouver but our analysis showed convenient living areas to be focused specifically along the Canada Line route on the west side of Vancouver and in downtown Vancouver. The only facilities that much of east and the further west side of Vancouver lacked, were hospitals, one of the main focuses of our analysis. The hospitals on our map were not very well distributed since many of them were found all around the center of the map, near the Canada Line SkyTrain stations. This could have been planned in a way so that people would not need to travel across the city to reach certain facilities. This can be convenient for many people but not as much for people without vehicles that live further away from the center of Vancouver. Another reason as to why the hospitals are fairly close may be because the hospitals also cater to different populations or specialize in specific illnesses, for example the Children's Hospital or the Vancouver Cancer Center. Having different types of hospitals may explain why so many of the hospitals are not spaced evenly throughout the City of Vancouver. Looking at downtown Vancouver, we see that the hospital is at the center of the peninsula, making it a central location that allows many residences with relatively easy and timely access to these hospitals. The downtown peninsula is not very large, so a central hospital would be sufficiently convenient for the majority population. We made the assumption that all senior citizens need to be near hospitals, but that might not be the case for some. For those that do not need to be close to hospitals and/or SkyTrains, there may be many other convenient areas in Vancouver that are within the proximity of other combinations of preferred facilities.

It was unexpected for 'convenience areas' to be restricted to downtown and the west side of Vancouver and as such, there may be socioeconomic and policy making implications that could justify this. The convenient areas detected in the west side may be due to higher tax contributions and/or differing allocation of tax money toward public service facilities in the East and West side of Vancouver. As supported by Lynch, the "...historic difference between the affluent west side and working-class East Van continues to influence the communities in these areas" (2014).While in the East side of Vancouver, the spending may be going to programing and assisting lower income citizens to better suit the working-class east side. It is also argued that with the success of certain public service institutions, such as schools and community centers, there is more incentive to further work in their catchment neighborhoods as opposed to increasing the participation or public service of areas that are supposedly less successful (Lynch, 2014). This could result in more facilities being proposed and built in certain areas where people think there needs to be more public services. In that, there could be more government funding going into establishing, maintaining, and improving public service facilities in downtown Vancouver and specific areas of the west side of Vancouver due to more interest and greater incentive to further improving convenience areas. Policy-making wise for example, there is the "1999 Community Amenity Contributions that implemented a city-wide CAC rezoning policy that assessed downtown Vancouver's land use urban design, livability, public benefits, engineering infrastructure, and traffic impacts" (City of Vancouver). In particular, CAC not only provides more facilities in downtown region to meet the needs, but also supports their long term operating and maintaining cost by providing services to low income and at-risk adults in select community centers (City of Vancouver 1999). This may have resulted with downtown Vancouver being more convenient for senior citizens.

With regards to 'convenience areas' being found in downtown Vancouver, some sources state that young adults ages 25-39 years old tend to live in highly commercial areas due to their close proximity to employment and entertainment facilities (Gold 2015). This makes life for these young adults very convenient. For people without a car, being near various facilities would be a large factor when choosing where to live. This would support our findings which are also looking at the proximity of residential areas to public facilities and the same may be true with senior citizens without cars considering the "orderliness of the west" (Gold 2015).

The findings of our analysis may have been generated from slightly outdated data, but many of the facilities are fairly permanent features, like SkyTrain stations, hospitals, and schools. As well, the City of Vancouver is undergoing many infrastructural changes due to increasing demands on the housing market. This could mean that some facilities may close due to the lack of funding and having housing prioritized over public facilities.

Error and Uncertainty

In general, much of the error and uncertainty for this project may have came about by human errors. There were likely discrepancies from outdated data and generalized assumptions when defining the needs and preferences of senior citizens. We based our generalizations on the needs and preferences of what our grandparents may want to have close by, but this does not represent all senior citizens. There were also multiple steps involved in this analysis, as shown on our flow chart (Refer to "Appendices: Flow Chart"), that could have introduced human error through the many stages of our project. First, manually selecting hospitals from the healthcare data involved decisions as to what we should categorize as a "hospital". Not all facilities were specific to whether they were hospitals or other healthcare facilities. We had to manually select the hospital data due to a lack of categorization of the healthcare dataset. Excluding data subjectively introduces error into the analysis because senior citizens may prefer or require care facilities, other than hospitals and clinics, that are included in the healthcare data. This dataset was available to us from one of our past labs in GEOB 270, and so, we are unsure when the data is from but we assumed it was somewhat outdated. In support of this, it was found that at least one of the facilities in the healthcare dataset had been shut down, as found by a quick google

search, since the last updating of dataset. The rest of our data were mostly updated in 2009, or completely up to date like in the SkyTrain stations dataset. This induces error into our analysis because the areas of convenient living are defined by their proximity to currently functioning facilities. Outdated data may include areas that are no longer within a reasonable distance of the needed facilities that are functioning. There was also error induced by the Vancouver schools dataset. This data set only contained public schools with the Vancouver School Board. There are also a number of private schools in Vancouver so this dataset lacks some information that could have also been helpful in our analysis. When defining buffer distances for the needed facilities, our buffers were based on the walking distance of an average adult over 10 minutes. This brings in uncertainty because not all individuals will walk about 800 meters in 10 minutes. There may also be senior citizens traveling in wheelchairs or scooters. This results in even more uncertainty as to how long it takes for them to travel to certain facilities to and from their home. There will be variations and knowledge of this variation is especially important in our analysis since our population is elderly and requires some degree of mobility to access the surrounding facilities.

Further Research/Recommendations

Further research on ideal living areas for the elderly population in Vancouver should consider their financial ability to attain long term housing, possible changes to settlement decision making given actions to increase convenience in the east side of Vancouver, determining the range of mobility of seniors associated with the proximity of the needed facilities to define the 'convenience areas', and finally, opting to increase the preferred facilities and features of accessibility that define convenient living areas.

The housing market in the City of Vancouver is growing rapidly which can make decisions of housing areas dependant on the buyer's financial capability to purchase and sustain living in that area. If seniors were to own or rent housing in the recommended areas, they would have to consider their financial ability to sustain living there given predicted increases in housing cost. The cost of housing in areas highly accessible to public and private service facilities would likely increase given increasing convenient accessibility to various facilities, making it harder for people, other than the very rich, to afford to live there. This makes preferred housing analysis more complicated as it needs to inquire about economically sustainable payment methods available to seniors rather than just accessibility to preferred facilities: assuming seniors are likely of the non-working and/or retired class. Given the convenience areas found, we can further investigate the housing affordability by analysing the current and projected price of housing in these areas. Actions to increase 'convenience' in the east side must also be considered in that this could affect the future distribution of 'convenience areas.' We should also define a range of mobility for the elderly population that could consider such areas accessible enough. This could include wheelchair and scooter access points for people that use them. Overall, we should further our definition of 'convenient areas' by adding more data on other service facilities to

accommodate the preferences of a more diverse elderly group. These might include commercial facilities, bus stops, and taxi pickup areas.

Appendices

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JPEG of flow chart and map also attached separately



