

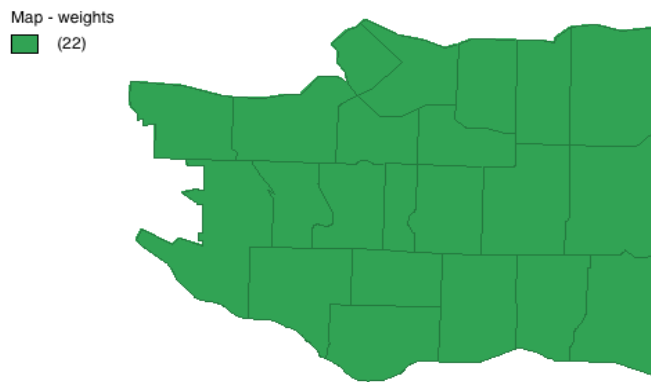
# Spatial Weights

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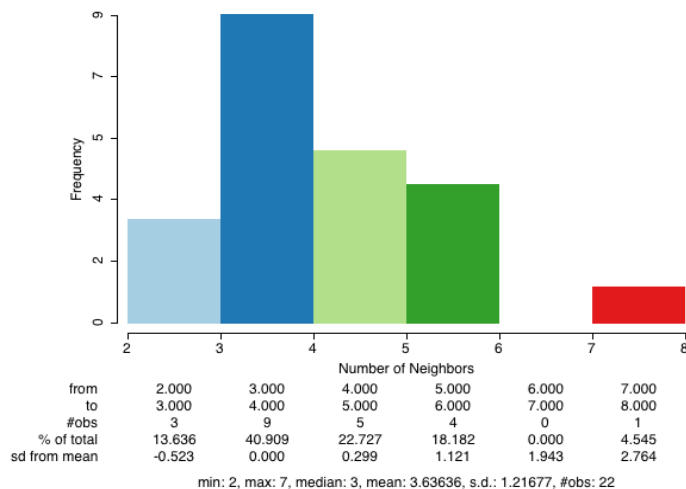
The main purpose of this report is to illustrate and compare characteristics of different spatial weights using community-level polygon layer map of the city of Vancouver, Canada. The city of Vancouver is divided into 22 communities with different numbers of neighboring communities. Here we want to explore the spatial features of neighboring communities in terms of both the contiguity-based and the distance-based spatial weights.

## 1. The original polygon layer map

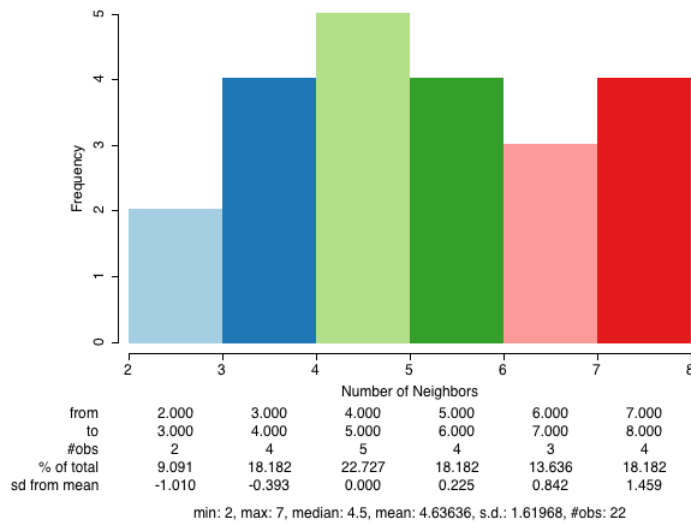
The original community-level polygon layer map of Vancouver is shown below.



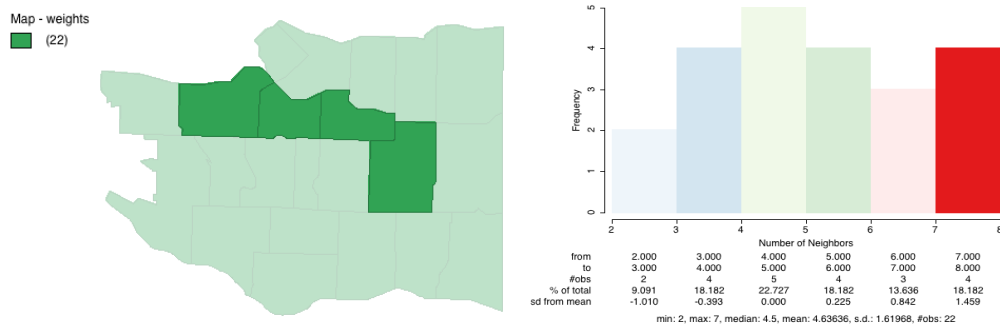
First we consider Rook contiguity of the first order and create the connectivity histogram. As we can see from the histogram below, the histogram is not symmetric but slightly right-skewed. The mode is three and there is no community with 6 contiguous neighboring community.



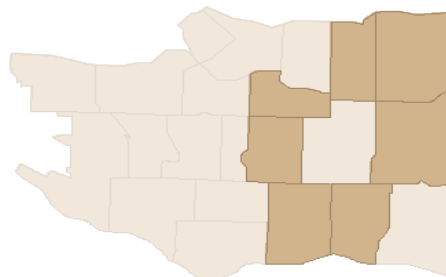
Next we consider the Queen contiguity of the first order and create the connectivity histogram. We can see from the histogram below that, this time, the histogram is not as skewed as the **root** contiguity histogram. The mode is 4 and right end of the histogram is higher than a normal symmetric histogram.



Click the rightmost bar, we can see the spatial distribution of those community with 7 queen contiguous neighboring communities.

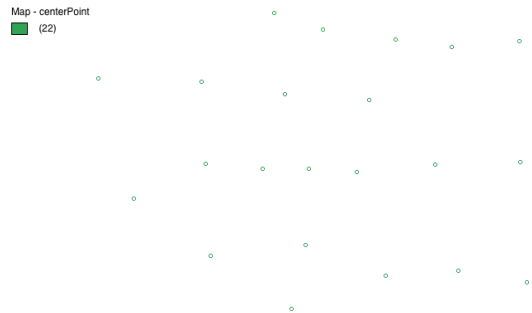


Next we plot the connectivity map to check the spatial distribution of one community's all 7 queen contiguous neighbors:

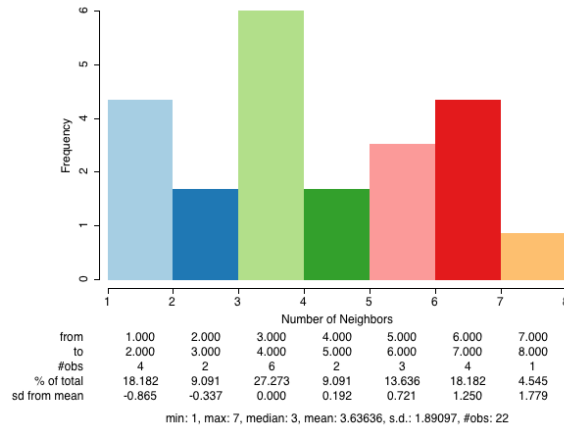


## 2. Point layer map

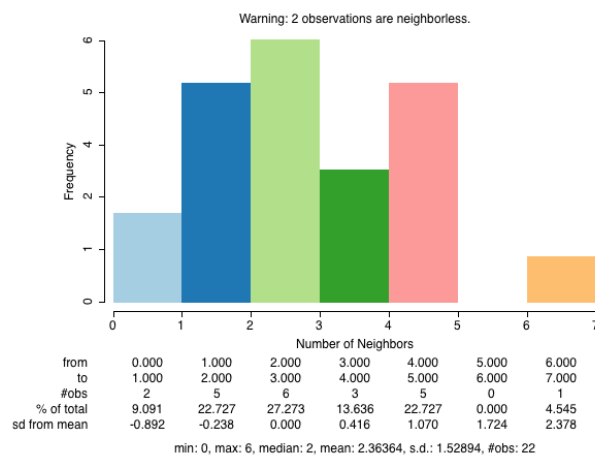
To explore the characteristics of distance-based spatial weights, we create the point layer map from the original polygon layer map by calculating the coordinates of the centroid for each polygon:



Then we create distance-based weight file choosing the default threshold distance 2924.01, and check the histogram of number of distance-based neighbors:

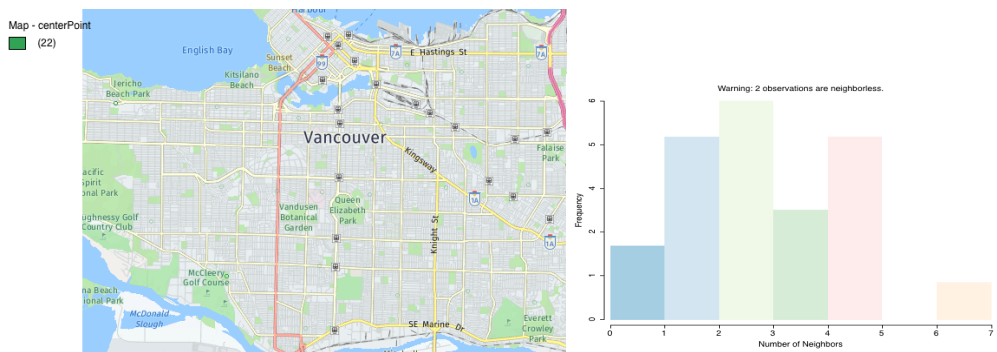


Next we choose a smaller threshold distance 2500 and plot the histogram of the number of neighbors, expecting some neighborless community points:



As we can see from histogram above, there are 2 neighborless community points using the new distance threshold, and we can check the locations of them using the

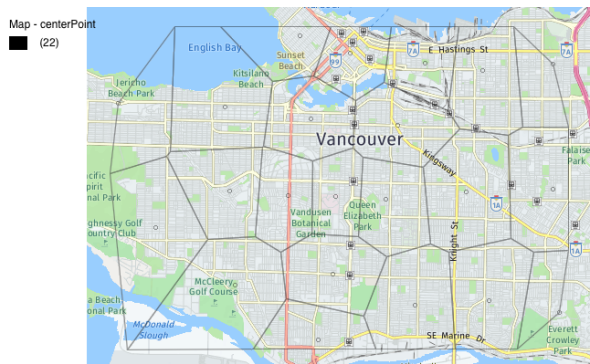
connectivity map:



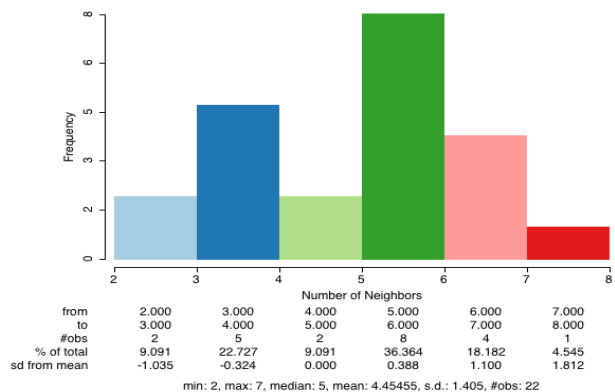
We can see these two community points are both on the west side of the city and both have relatively large distances from other community points in the east.

### 3. Thiessen polygon map

To generalize the concept of contiguity, we can construct Thiessen polygon map from the previous point map:



Based on this derived polygon map, we can explore the contiguity spatial weights as before. First we consider the queen contiguity of the first order. The histogram of the number of neighbors now is more symmetric than the previous one based on the original polygon map:



Now we consider the queen contiguity of the second order. As we can see from the following histogram, now the number of neighbors generally increase for each bin, and the number of neighbors in the left end of the distribution is higher than the normal symmetric histogram which indicates an extra cluster of communities using the second order:

