Association between local venues on Foursquare and life expectancy in Osaka city, Japan

Introduction

In Japan, it has been pointed out that there is a health gap depending on the area where people live. In particular, Osaka City is considered to have a serious problem and is an important issue for public health. In fact, local governments in Japan are making plans to build communities where people can live healthily. Therefore, I cluster regions based on the Venues published on Foursquare and examine whether they are related to life expectancy in order to use them as basic data for formulating administrative policies.

Data

Divides Osaka City into 24 boroughs and extracts Venues for each borough from Foursquare posts. For 24 boroughs, administrative districts extracted from the Wikipedia page (https://en.wikipedia.org/wiki/Osaka#List_of_wards) were used. The life expectancy data of each borough was extracted from the Osaka City website (https ://www.city.osaka.lg.jp/toshikeikaku/page/0000249886 .html).

Methodology

Cluster analysis using the K-means method was conducted to divide the 24 boroughs of Osaka City into two groups. There was a possibility of dividing into three or more clusters, but when comparing their average life expectancies, if the number of boroughs included in each cluster is too small, it lacks representativeness, so I divided into two clusters. In this study, the k-means method was adopted because the number of cluster is limited to two and the algorithm is simple and easy to interpret.

Box plots of the average life expectancy between each of the two groups extracted from the cluster analysis are created and unpaired t-tests were performed.

Results

Life expectancy of men was 72.4 years, the lowest in Nishinari-ku and 79.6 years, the highest in Tennoji-ku, with a difference of 7.2 years. For women, Nishinari-ku had the shortest life expectancy at 83.8 years old, and Tennoji-ku had the longest life expectancy at 86.1 years old, with a difference of 2.3 years old. (Figure1 and 2)

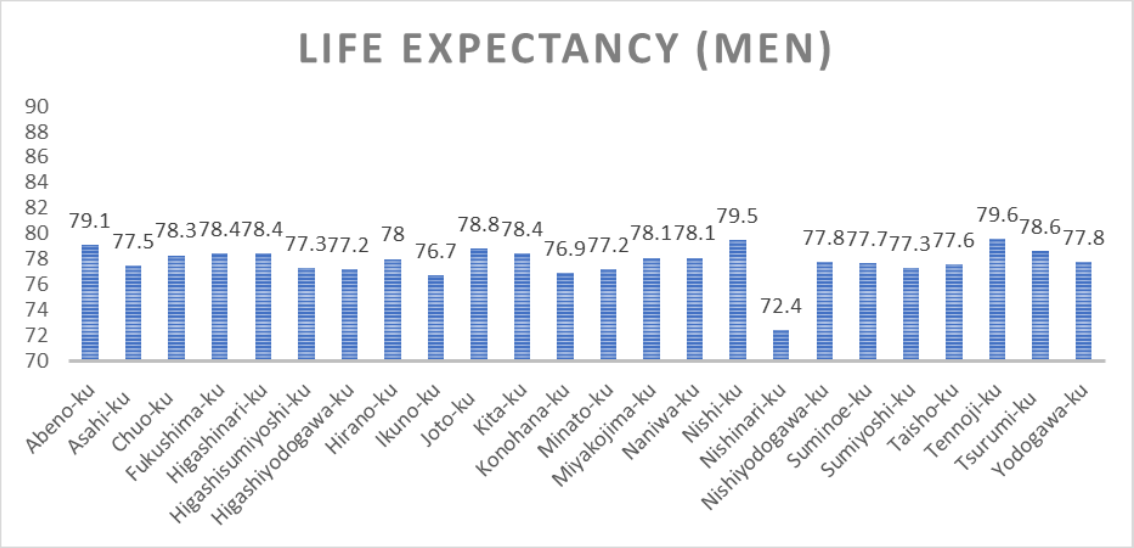

Figure1. Life expectancy of men by each borough in Osaka

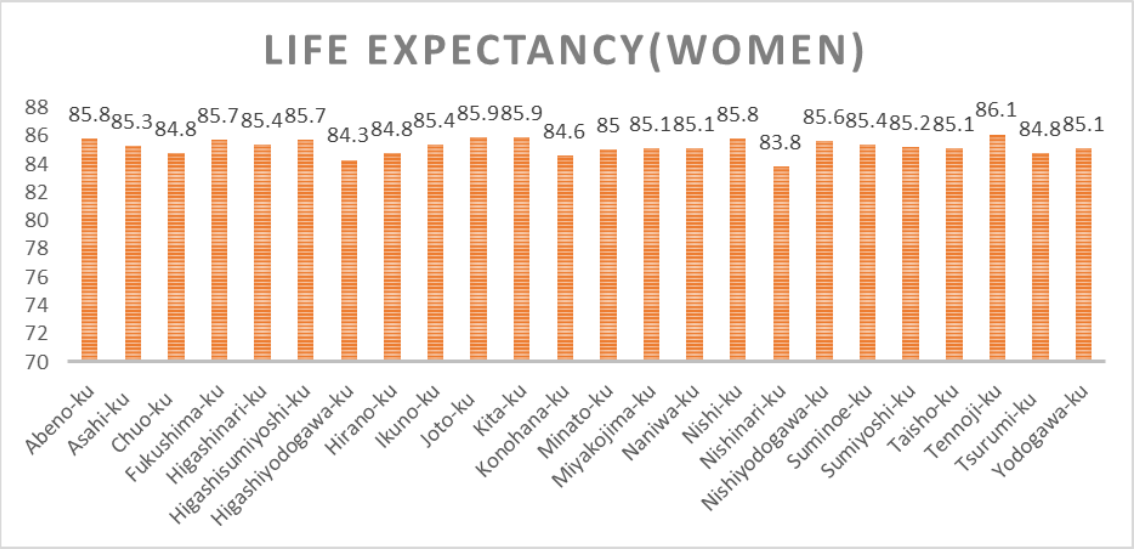

Figure2. Life expectancy of women by each borough in Osaka

On Foursquare, most popular venues in Osaka city were convenience stores. On the other hand, in some boroughs, there were characteristic Venues such as sporting goods shops and historical sites.(Table. 1)

Table1. The number of Venues per borough and Top 3 Venue categories

Borough	Number of venues	Top 3 Venue Categories		
		1st	2nd	3rd
Abeno-ku	19	Convenience Store	Café	Japanese Curry Restaurant
Asahi-ku	23	Convenience Store	Sake Bar	Donburi Restaurant
Chuo-ku	88	Sushi Restaurant	Japanese Restaurant	Convenience Store
Fukushima-ku	51	Convenience Store	Fast Food Restaurant	Ramen Restaurant
Higashinari-ku	4	Shopping Mall	BBQ Joint	Convenience Store
Higashisumiyoshi-ku	16	Convenience Store	Supermarket	Chinese Restaurant
Higashiyodogawa-ku	29	Convenience Store	Chinese Restaurant	Discount Store
Hirano-ku	5	Convenience Store	Japanese Restaurant	Liquor Store
Ikuno-ku	13	Convenience Store	BBQ Joint	Supermarket
Joto-ku	17	Convenience Store	Intersection	Japanese Restaurant
Kita-ku	55	Convenience Store	Ramen Restaurant	Sake Bar
Konohana-ku	3	Convenience Store	Distribution Center	Yoshoku Restaurant

Borough	Number of venues	Top 3 Venue Categories		
		1st	2nd	3rd
Minato-ku	28	Convenience Store	Soba Restaurant	Park
Miyakojima-ku	48	Convenience Store	Japanese Restaurant	Supermarket
Naniwa-ku	32	Convenience Store	Japanese Curry Restaurant	Intersection
Nishi-ku	41	Convenience Store	Train Station	Supermarket
Nishinari-ku	14	Convenience Store	Noodle House	Donburi Restaurant
Nishiyodogawa-ku	15	Convenience Store	Supermarket	Grocery Store
Suminoe-ku	12	Sporting Goods Shop	Japanese Curry Restaurant	Athletics & Sports
Sumiyoshi-ku	15	Convenience Store	Italian Restaurant	Train Station
Taisho-ku	19	Convenience Store	Donburi Restaurant	Fast Food Restaurant
Tennoji-ku	20	Bus Stop	Historic Site	Noodle House
Tsurumi-ku	4	Scenic Lookout	Trail	Café
Yodogawa-ku	13	Convenience Store	Supermarket	Intersection

The cluster was separated into the central part (Cluster 1) and the peripheral part (Cluster 0). Cluster 0 includes Yodogawa-ku, Nishiyodogawa-ku, Nishi-ku, Konohana-ku, Nishinari-ku, Higashiyodogawa-ku, Asahi-ku, Joto-ku, Higashisumiyoshi-ku, Hirano-ku and Sumiyoshi-ku. Cluster 1 includes Fukushima-ku, Naniwa-ku, Taisho-ku, Suminoe-ku, Suminoe-ku, Miyakojima-ku, Higashinari-ku, Ikuno-ku and Abeno-ku. (Figure 3)

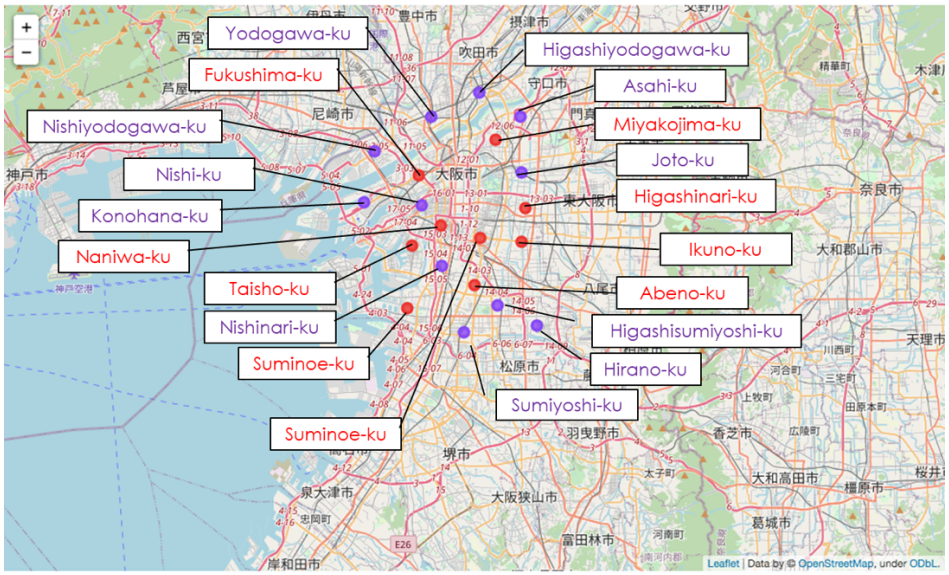

Figure 3. Map with clusters plotted

In cluster 0, the mean life expectancy was 77.33 ± 1.89 years for men and 85.12 ± 0.62 years for women. In cluster 1, the mean life expectancy was 78.05 ± 0.75 years for men and 85.31 ± 0.47 years for women. The result of t-test for cluster 0 and cluster 1 were T-value = 1.2441 and P-Value = 0.2265 in men and T-value = 0.7889 and P-Value = 0.4386 in women. (Figure 4)

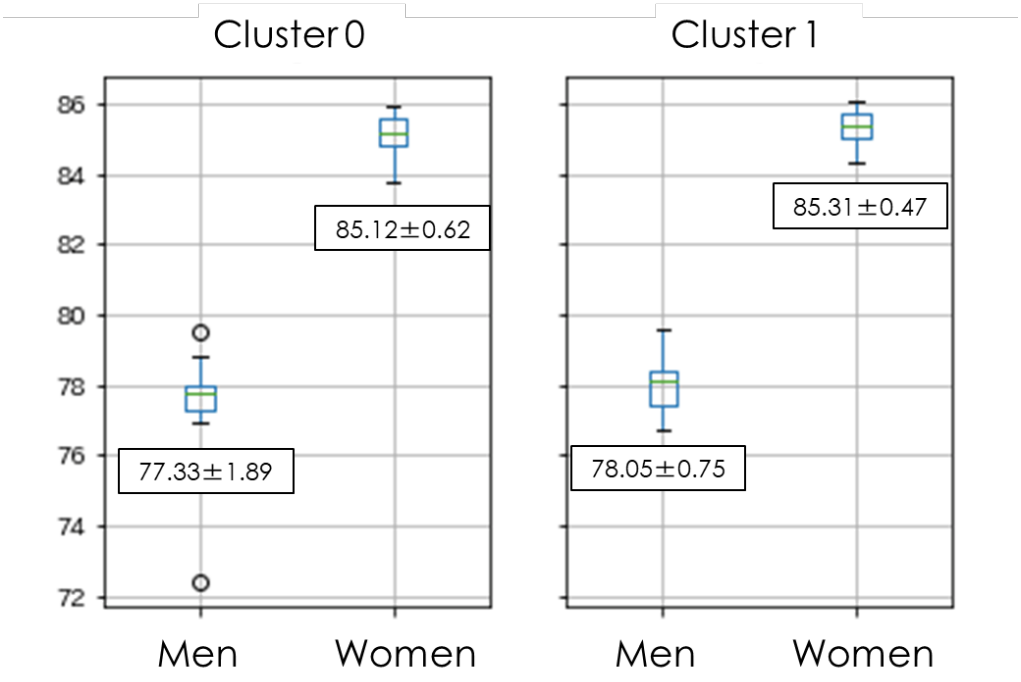

Figure 4. Comparison of Life Expectancy by Gender for Each Cluster

Discussion

When Osaka City was divided into clusters based on the Venues posted on Foursquare, it was divided into the central and peripheral areas of the city. Osaka City is one of the largest cities in western Japan, but the composition of Venues is very different in the central and peripheral areas, and the lifestyle may be different. In fact, there are academic reports that the shorter the distance between a convenience store and one's home, the poorer one's health.

The difference in life expectancy between the clusters was not statistically significant. However, the analysis was conducted in 24 districts of Osaka City, and there is a problem of detection power due to sample size. Since there seems to be a difference when looking at the average life expectancy value itself, it cannot be denied that there is a relationship between local venues and the average life expectancy of the area.

Thus, there are several limitations to this report. First, the sample size was small in 24 venues. Second, other municipalities could also be added, but in Japan, data disclosure was limited to a wider range of municipalities (prefectural unit), making analysis difficult. Finally, most of the data in Japan is marked in Japanese, and the language became a barrier and a problem when combining with Foursquare data.

Since it cannot be denied that the composition of local Venues may have an impact on people's health, I hope that Japan's data will become more open and international in the future, and that further research will be needed.

Conclusion

No statistical differences were found between Foursquare's Venues and life expectancy. However, since there are differences in the values themselves of the average life expectancy, it is desirable to increase the sample size and investigate further.